Advant® OCS
with Master software

MasterNet™

User's Guide

3BSE 003 839R0201

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Chapter 1 Introduction

1.1 General Information

ABB MasterNet is the name given to the ABB Advant OCS Computer Network Communication System. This manual is intended for ABB personnel engaged in quotation and installation, as well as for customers' maintenance personnel.

In addition to MasterBus 200, MasterBus 300 and MasterBus 300 Extended, there are some external communication concepts within the Advant OCS Communication system, namely RCOM, GCOM, EXCOM, MVI and ABB MasterGate 230/1.

- RCOM is used for Remote COMmunication. Configuration includes point-to-point, multidrop or switched telephone lines.
- GCOM provides a powerful communication link from external computers to the Advant OCS system.
- EXCOM is an easy-to-implement ASCII-coded request/reply protocol which provides access to the Controller process database in the MasterPiece 200/1 or Advant Controller 400 series.
- Multi Vendor Interface (MVI) is used for communication with other manufacturer's control systems.
- ABB MasterGate 230/1 is used to link alien computers to MasterNet and to interconnect separate Control Networks into Plant Networks.

For further information about RCOM, GCOM, EXCOM, MVI and ABB MasterGate 230/1, please refer to the relevant manual.

1.2 Equipment Requirements

All MasterBus 300/300E communication equipment used, such as cables, transceivers, repeaters, bridges, etc., must comply with the IEEE 802.3 - 1985 (ISO 8802.3) standard.

1.3 Manual Organization

This manual covers configuration possibilities and limitations as well as installation instructions for MasterBus 300/300E in ABB MasterPiece 200/1, ABB MasterView 800/1, ABB MasterGate 230/1, ABB Advant Station 500 series and ABB Advant Controller 400 series. See Appendix A, MasterBus 200 for installation instructions for the MasterBus 200.

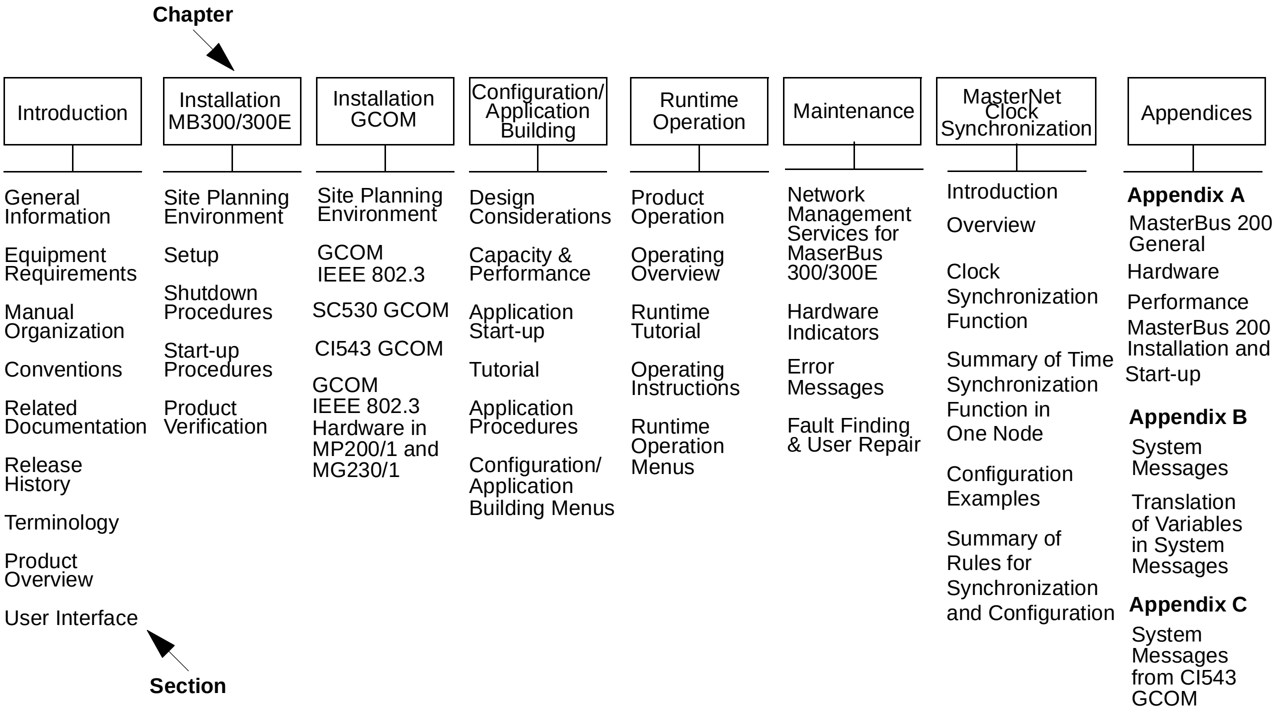


Figure 1-1. Manual Organization

1.4 Conventions

Operator Station is the phrase commonly used in this document to refer to MasterView 800 and Advant Station 520.

Controller is the phrase commonly used in this document to refer to MasterPiece 200/1, Advant Controller 450 and Advant Controller 410.

1.5 Related Documentation

Related documents for MasterNet, including those referred to in this document, are listed below in Table 1-1.

Table 1-1. Related Documents

Manual	Description
GCOM Board User's Guide	Contains a technical description, instructions for installation, start-up and fault tracing for GCOM in Advant Controller 400 series.
ABB Master GCOM Multidrop	Contains information for the user of the GCOM mulitdrop bus.

Table 1-1. Related Documents (Continued)

Manual	Description
ABB Master GCOM Point- to-Point	Contains information for the user of the GCOM point-to-point bus.
MasterGate 230/1 Technical Description	The technical description of MasterGate 230/1.
MasterGate 230/1 Installation and Error Codes	Installation guide for MasterGate 230/1 (Strapping of DSCS 150)
Advant Station 510 Hardware Description	Describes the hardware in, and related to, the Advant Station 510.
Advant Station 515 Hardware Description	Describes the hardware in, and related to, the Advant Station 515.
Advant Station 520i Hardware Description	Describes the hardware in, and related to, the Advant Station 520i.
Data Base Elements Advant Controller 400 Series Reference, Manual	Description of the Data Base Elements for AC 400 series
AMPL Configuration Advant Controller 400 Series	Description of how to configure and program the AC 400 series.

1.6 Release History

This is the second version, covering MasterBus 300, MasterBus 300E, and GCOM.

1.7 Terminology

The following terminology is used in this manual:

Advant OCS	Advant Open Controller System
AS 500 Series	Advant Station 510/515/520i/530
AC 400 Series	Advant Controller 410/450
AC	Advant Controller
MP	MasterPiece
MV	MasterView
MG	MasterGate
MB	MasterBus
AUI	Attachment Unit Interface
DSX	Distributed Signal Exchange
GCOM	Generic Communication
LAN	Local Area Network

Advant OCS	Advant Open Controller System
AS 500 Series	Advant Station 510/515/520i/530
AC 400 Series	Advant Controller 410/450
LDB	Long Distance Bus, a MasterBus 200 concept
MB 300	MasterBus 300
MB 300E	MasterBus 300 Extended
MB 200	MasterBus 200
MVI	Multi Vendor Interface
SDB	Short Distance Bus, a MasterBus 200 concept
DSX	Distributed Signal Exchange
EAS	Explicitly Addressed Signal
ISO	International Standard Organization
IEEE	Institute of Electrical and Electronics Engineers
TCP/IP	Transmission Control Protocol/Internet Protocol (used as a synonym for the TCP/IP protocol suite)
SC5X0	Submodule Carrier SC510, SC520 or SC530.

1.8 Product Overview

ABB MasterNet is a **L**ocal **A**rea **N**etwork (**LAN**) which interconnects the various nodes in an Advant OCS system. A device for communication, the node can act as either an end node or an intermediate node in the system.

MasterNet has the following components:

- MasterBus, which interconnects the various Advant OCS nodes.
- MasterGate, which connects alien computers and communication systems, and is also used to interconnect separate Control Networks into the Plant Network.

Advant Station 500 series, Advant Controller 400 series, MasterView 800/1, MasterPiece 200/1 and MasterGate 230/1 stations are all communicating nodes in an Advant OCS system.

1.8.1 MasterNet Architecture

MasterNet is divided into two basic subsystems. One is called the protocol stack, which manages the transmission of data between users, irrespective of the network topology.
The other, the transport user subsystem, constitutes the user of the protocol stack.

The purpose of the protocol stack is to provide its user network-independent, transparent and connection-oriented transport service of user data.

The user of the protocol stack is the MasterNet software service Distributed Signal Exchange (DSX).

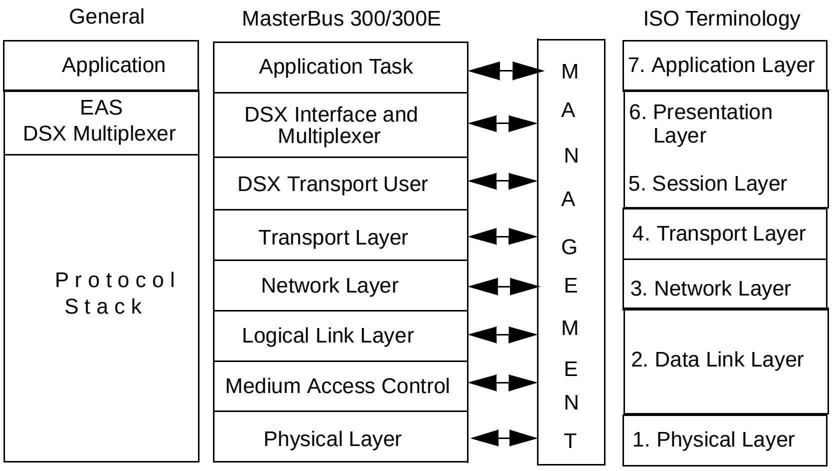


Figure 1-2. MasterNet Architecture

The protocol stack is layered with the advantage that software and hardware products can be added, exchanged or deleted within a layer without affecting higher layers (as long as the modifications do not involve removing services required by higher layers).

1.8.1.1 Layer 7

Cooperating tasks must have the means to communicate and synchronize with one another to coordinate their activities and to exchange information. When performed in an uncontrolled way, e.g., via common memory areas, such communication easily introduces and propagates errors in the system. The Advant OCS controllers operating system inter-task communication, Explicitly Addressed Signal (EAS) service, permits tasks to communicate and synchronize in a safe way by passing software signals to each other.

A software signal is a message which is sent from one task to one or several other tasks. The task that sends the signal does not address the receiving task directly. Instead it refers to a channel. A channel is a queue to which signals can be sent and from which signals can be received.

Examples of application tasks include object handlers and dialogue interpreter tasks for man-machine communication. Data Set Communication, Symbol Translation, EXCOM, Clock Synchronization, Console Communication via network, Network Management Service Providers, etc.

MasterNet Network Management consists of a Network Directory service and a set of tools for network management.

With the Directory service, you can relate symbolic names to their physical locations within an Advant OCS system.

Network Management services are divided into the following categories:

- Communication Monitoring, which is a tool for reading communication data structures and for monitoring the status of the network.

- Operational Management, which consists of Parameter Manipulation and Remote Software Control.
    - Parameter Manipulation, which modifies communication parameters for configuration control.
    - Remote Software Control, which consists of services for up- and down-line loading, implemented on the GCOM board (CI543) only, as well as services for initializing a node, implemented on GCOM (CI543) and MasterBus 300 (CS513).
- Statistic Management, which points out specific bottlenecks and traffic problems.
- Network Probing, which is a tool for testing node-to-node communication.
- Fault Management, which identifies communication problems and errors. It provides tools to define actions triggered when certain user-defined events occur in MasterNet.

There are two basic parts to Network Management. One is the Command Processor, which is available on flexible disc. The Command Processor requires Advant Station 100 Series Engineering Station or the corresponding software since it is installed in an Advant Station 500 series and executed on the Real Time Accelerator Board PU510.

The other part of Network Management is the Service Provider, which resides in the target machine (Advant Controller 400 series, Advant Station 500 series, MasterPiece 200/1, MasterView 800/1 or MasterGate 230/1).

1.8.1.2 Layers 6 and 5

Distributed Signal Exchange (DSX) is a communication service invoked by the DS 101CX EAS (Explicitly Addressed Signal) service when EAS signals are sent to remote tasks.

A transport user is basically a transparent interface between an application process and the transport subsystem. In this way, it is unnecessary for any application task to know whether a resource is located remotely or locally. An application program always calls only the local DS 101CX inter-task communication services.

The purpose of the presentation layer in the OSI model, which has been combined with the session layer to form a transport user, is (when required to convert character codes, representation of data elements and message structure (syntax) without distortion) to present data to the different application units to permit data processing, e.g., conversion between different floating point number representations.

The purpose of the session layer is to provide interacting users with the means of organizing and synchronizing data exchange. It is the session section of the transport user which establishes connections to its peer and ensures that an effective data exchange is maintained.

1.8.1.3 Layer 4

The transport layer is based upon ISO transport protocol class 4 and includes segmentation and reassembly of user data, flow control in combination with pipelining, error detection and recovery. However, because of performance requirements in smaller systems, MasterBus 200 uses a “null” transport layer.

Signals are sent with one of three priorities. For each priority and destination node, one transport connection is established. A maximum of three transport connections can be established between each pair of communicating nodes. As the signal priority is the main mechanism to control the MasterNet buffer utilization, signals allowing the operator to control the system (e.g., orders) are sent by the application tasks with highest priority.

MasterNet communication service is a truly confirmed service, i.e., if an application task overflows, signals are stored in communication buffers and the sender is prevented from continuing to send on the transport connection through a mechanism called back pressure. As soon as the application receives again, the sender is given credit to continue and the stored buffers are enqueued to the application task.

Even if the system is overloaded, signals received with highest priority are always enqueued to the application, even if it requires buffer stealing. Signals with lowest priority are stolen first. This is very important since, for example, orders may be processed even if the system is overloaded.

1.8.1.4 Layer 3

The network layer includes a dynamic routing scheme, suitable for different types of network topology. The algorithm supports alternative paths and automatically adapts to topology changes.

MasterNet is used for distributed process control and within factory automation. Routing between buses is normally not required as most of these applications are broadcast. A message can be sent from one station to another station connected to the same bus without any form of routing.

However, interconnecting all stations to one bus has some disadvantages. As most of the underlying medium access control algorithms depend to a large extent on the number of stations connected to the bus, the station access delay increases when the number of stations increases.

The use of store and forward routers between the communicating end-nodes allows complete independence between individual buses, so these buses can operate at different speeds and use alternative technologies. MasterBus 200 and 300/300E exemplify this flexibility. MasterPiece 200, MasterView 800/1, MasterGate 230/1, Advant Controller 450, Advant Controller 410, and Advant Station 500 Series stations can all perform routing functions.

A MasterNet network topology can be structured to reflect the organization of the application. The alternative MasterBuses can be combined into control systems that can be used in applications ranging from small machine control systems to total plant control systems.

The interconnection of multiple buses can provide redundancy and therefore an increased system availability. MasterNet provides alternative paths through the network and quickly adapts to failures. It selects the shortest path between the communicating nodes. Traffic conditions are considered only if more than one shortest path exists.

MasterNet is self-configuring, which means that the network topology should not be described by the user of the system in any way; MasterNet finds out for itself. New stations are automatically included as soon as they are connected and started.

1.8.1.5 Layer 2

MasterBus 200 and MasterBus 300/300E are all entities in the data link layer. MasterBus 300 conforms to IEEE 802.2 class 1 connection less unconfirmed data link service and to IEEE 802.3 CSMA/CD (Carrier Sense Multiple Access Collision Detection).

MasterBus 200 is connection-oriented confirmed data link services with segmentation and reassembly of user data. MasterNet supports different ways of gaining access to a shared physical medium. MasterBus 200 medium access is controlled by a master node which cyclically polls all slaves on the bus. MasterBus 300 medium access control is distributed to all nodes on the bus.

1.8.1.6 Layer 1

The physical layer provides the electrical and mechanical connection for transmission of bits between nodes. MasterBus 200 is a medium-speed, serial, asynchronous, half duplex bus (RS 422) which functions in multidrop or point-to-point configurations. MasterBus 300/300E is a high-performance, serial, synchronous, half duplex bus which conforms to the IEEE 802.3 standard.

1.9 User Interface

Between the Operator Stations and the Controllers, information is exchanged through predefined messages for display updates, manual orders, events and alarms, etc. This information exchange does not have to be explicitly defined by the user, but implicitly given, e.g., when process displays are built and used in the Operator Stations.

Information is exchanged between separate Controllers by means of Data Sets or Text Sets, i.e., messages containing aggregates of data base information. Data Sets and TextSets must be explicitly specified in the communicating Controller, as a part of the application programming.

Chapter 2 Installation MasterBus 300/300E

2.1 Site Planning Environment

This chapter is the installation guide for MasterBus 300/300E and GCOM IEEE 802.3 in the following ABB Master and Advant OCS stations:

- MasterPiece 200/1
- MasterView 850/1
- MasterGate 230/1
- Advant Station 500 Series
- Advant Controller 410
- Advant Controller 450.

2.1.1 MasterBus 300

MasterBus 300 is a high-performance serial synchronous half duplex bus for medium communication distances. Use it to interconnect Process Stations, Operator Stations and MasterGate 230/1 stations in a Control Network.

You can also use MasterBus 300 with MasterGate 230/1 to interconnect Control Networks into a Plant Network. MasterBus 300 conforms to IEEE 802.2 class 1 connection less unconfirmed data link service and to IEEE 802.3-1985 CSMA/CD (Carrier Sense Multiple Access Collision Detection). The medium access control is distributed to all nodes on the bus. Before a message is sent, the sending node "listens" to determine if the medium is free. Additionally, the sending node continuously listens for collisions while sending. If a collision occurs or if the medium is busy, then the node backs off for a random period of time before retrying.

A connection-oriented transport protocol, according to ISO class 4, ensures flow control and reliability.

Physically, MasterBus 300 is a multidrop link built in segments with coaxial cable. Several segments can be linked together with link segments and repeaters.

The maximum configuration is defined by IEEE 802.3-1985 as follows:

- A trunk coaxial cable, terminated in its characteristic impedance at each end, constitutes a coax segment. A coax segment can contain a maximum of 500 m of coaxial cable.
  The maximum end-to-end propagation delay for a coax segment is 2165 ns.
- A point-to-point link constitutes a link segment. A link segment can contain a maximum end-to-end propagation delay of 2750 ns and must terminate in a repeater set at each end. You are not permitted to connect stations to a link segment.
- Repeater sets are required for segment interconnection. Repeater sets occupy transceiver positions on coax segments. Repeater sets can be located in any transceiver position on a coax segment but must be located only at the ends of a link segment.

- The maximum transmission path permitted between any two stations is five segments, four repeater sets, two transceivers and two access unit interface cables. Of the five segments, a maximum of three can be coax segments; the remainder are link segments.
- If only two link segments are used on the entire bus and they are adjacent, the repeater set joining the link segments is not required, so the maximum point-to-point connection is 1000 m.
- The total propagation delay between end nodes on a MasterBus 300 must not exceed 20600 ns, including the propagation delay in the transmission equipment and the drop cables (approximately 9000 ns).

The maximum length of one coax segment is 500 m. A larger distance can be covered by connecting several segments with repeaters, if required, with special link segments (point-to-point connections) between two repeaters. The maximum cable length between any two stations on the bus, including repeaters (IEEE 802.3 - 1985) and possible point-to-point connections between repeaters, is then 2500 m.

Using fiber optical cable and star-shaped topology with active star couplers (sold by vendors other than ABB), the maximum distance between two stations can be 4500 m, bearing in mind the limitations stated in the IEEE 802.3 standard regarding the detection of collisions. Deviations from these limitations can normally be solved by connecting bridges for filtering and connection between networks.

Please note that a fiber optical point-to-point link and repeater set is recommended to interconnect coaxial segments between buildings. As an alternative, the coax cable can be used between buildings, but must then be installed under certain directions as defined later in this section.

You do not have to make the 500 m maximum length coaxial cable segment from a single, homogeneous length of cable. However, the boundary between two cable sections represents a signal reflection point because of the impedance discontinuity. For this reason, if you choose to configure long cable segments (up to 500 m) from smaller sections, do it with care.
The following recommendations, in order of preference, apply:

- If possible, make the total segment from one homogeneous (no breaks) cable. This is feasible for short segments and results in minimal reflections from cable impedance discontinuity.
- If you build cable segments from smaller sections, all sections should come from the same manufacturer and lot.
- If you use uncontrolled cable sections to build up a longer segment, choose the lengths so that reflections, when they occur, do not have a high probability of adding in phase.
  To accomplish this, use lengths that are odd integral multiples of a half wavelength in the cable at 5 MHz; this corresponds to using lengths of 23.4 m, 70.2 m and 117 m (± 0.5 m) for all sections. Using these lengths exclusively, you can use any mix or match of cable sections to build up a 500 m segment without incurring excessive reflections.

You must make in-line coaxial extensions between two sections of coaxial cable with a pair of type N receptacle connectors, in accordance with IEEE 802.3 - 1985.

Use coaxial cable terminators to provide a termination impedance for the cable equal in value to its characteristic impedance, thereby minimizing reflection from the ends of the cables.

NOTE

Connect only one of the coaxial cable terminators or in-line connectors to ground.

The attenuation of a 500 m cable segment must not exceed 8.5 dB measured with a 10 MHz sine wave or 6.0 dB measured with a 5 MHz sine wave.

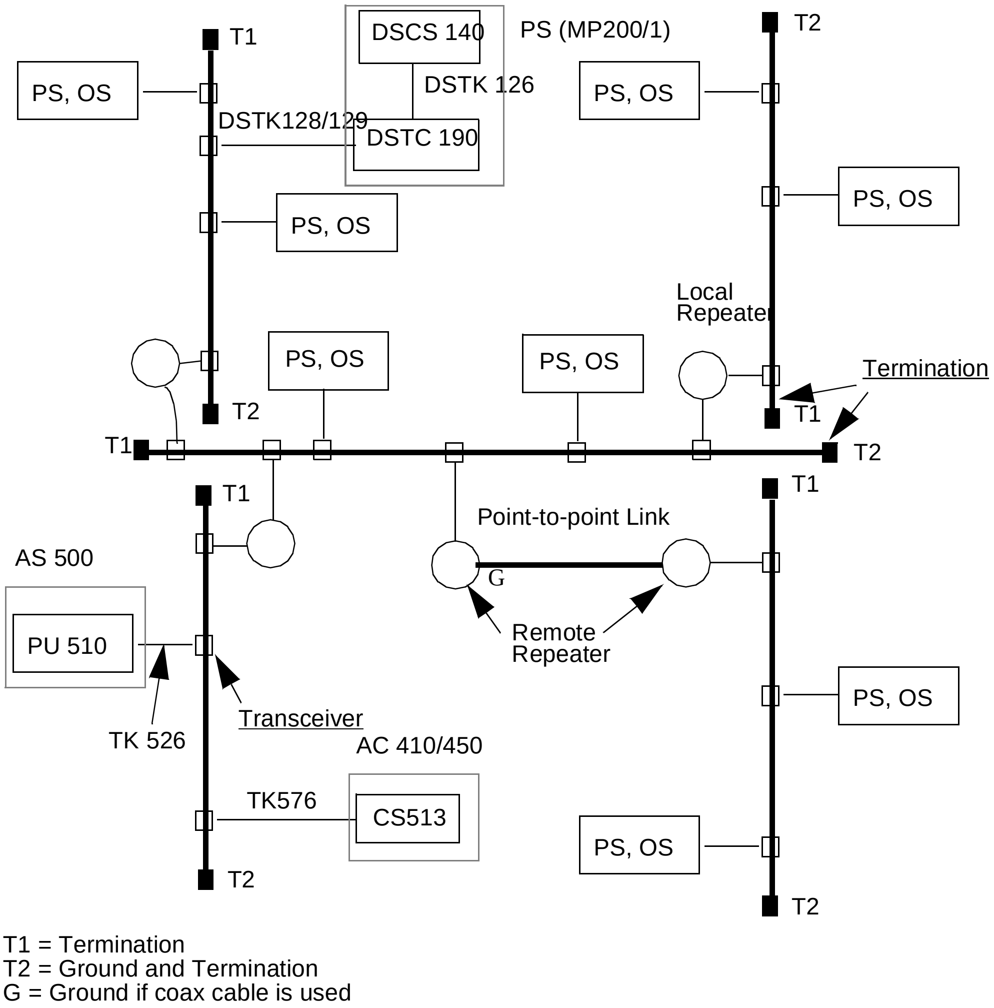


Figure 2-1. MasterBus 300 Physical Configuration

NOTE

Repeater set with coaxial or fiber optical point-to-point cable must be in accordance with IEEE 802.3 specifications.

Please see Section 2.1.2, MasterBus 300E (MasterBus 300 Extended) for information about MasterBus 300E physical configuration.

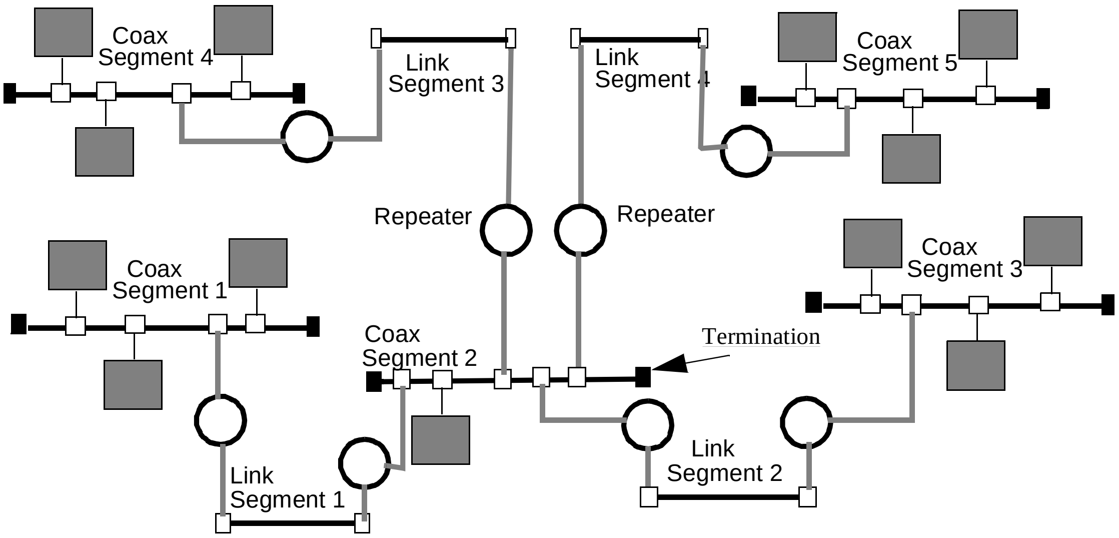


Figure 2-2. MasterBus 300 Maximum Transmission Paths

Please note that alien computer systems or the Advant Station 500's TCP/IP LAN must not be connected to the same physical IEEE 802.3 - 1985 bus as the MasterBus 300/300E on the Control Network since system performance is influenced by the following:

- The Advant OCS stations receive all broadcast messages sent from the alien system as well as all the group address messages passing through a group address filter. This reduces ABB Master's performance because buffers are occupied for these messages until they are deallocated by the Medium Access Control (MAC) layer in the MasterBus 300 datalink handler.
- All Advant OCS stations periodically send routing vectors with group addresses (multicast), which can reduce performance in the alien computer system.
- System performance is reduced because of the relative decrease in bandwidth for MasterBus 300. System performance figures presented in this document or in any other Advant OCS document are not guaranteed.

Messages can be routed from one MasterBus 300 to another via an intermediate node. The maximum routing distance is defined in the data base and is normally not under user control. If necessary, however, you can reduce the MasterBus 300 communication depth. Please refer to FILTER and OVERRIDE as described in Section 2.2.9.4, Network Layer (NL).

CAUTION

If you plan to install MasterBus 300 trunk coaxial cable between buildings, you must use a coax cable for outdoor use routed in a metal tube (together with a 35 mm^2 earth wire along the tube) or a fiber optical link with repeaters. The metal tube must be grounded at least at both ends. Note that the coax cable must be installed in cable ducts with a minimum depth of 80 cm. The distance to other cables in the duct must be at least 30 cm. A separate overvoltage protection device is not required.

2.1.2 MasterBus 300E (MasterBus 300 Extended)

MasterBus 300E (Extended) is a serial synchronous half duplex bus for medium to long communication distances. Use it to interconnect MasterPiece 200, MasterView 800, Advant Station 500 stations and MasterGate 230 stations in a Control Network. You can also use MasterBus 300E with MasterGate 230 to interconnect Control Networks into a Plant Network. MasterBus 300E conforms to IEEE 802.2 class 1 connection less unconfirmed data link service and to IEEE 802.3 - 1985 CSMA/CD (Carrier Sense Multiple Access Collision Detection).

A connection-oriented transport protocol, according to ISO class 4, ensures flow control and reliability. A dynamic re-send timer has been implemented so the transport layer can adopt to communication speeds lower than 10 Mbit/s. Physically, MasterBus 300E is a multidrop or point-to-point link built in segments with coaxial and/or fiber-optic cable. Segments can be interconnected with bridges and/or repeaters following the IEEE 802.3 standard.

Please note that alien computer systems or the Advant Station 500's TCP/IP LAN must not be connected to the same Control Network as the MasterBus 300E, since system performance is influenced by the following:

- The Advant OCS stations receive all broadcast messages sent from the alien system as well as all the group address messages passing through a group address filter. This reduces ABB Master's performance because buffers are occupied for these messages until they are deallocated by the Medium Access Control (MAC) layer.
- All Advant OCS stations periodically (every 1-12.7 seconds) send routing vectors with group addresses, which can reduce performance in the alien computer system.
- System performance is reduced because of the relative decrease in bandwidth for MasterBus 300E. System performance figures presented in this document or in any other Advant OCS document are not guaranteed.

Messages can be transited between different types of buses (MasterBus 200/300 and via the GCOM protocol) via an intermediate node (transit node). The maximum communication distance is via two intermediate nodes.

You can change the DSCS 145 board or CS513 module "on line," but adding a new board/module is not recommended unless **you are sure** that you have enough spare RWM. To change the DSCS 145 board "on line," you need:

- 5 kByte spare RWM for each DSCS 145 board

To change the CS513 module "on line," you need:

- 10 kByte spare RWM for each SC520 board
- 4 kByte spare RWM for each SC510 board.

2.2 Setup

The values strapped on the CS513 communication modules for network, node number, slave number, and protocol type are read by the system and reflected in the data base element (this terminals are marked with bold figures/texts in the data base element figures for LANn).

2.2.1 MasterBus 300 Hardware in MP 200/1, MV 800/1 and MG 230/1

MaterBus 300 consists of a rack-mounted communication board DSCS 140 and a connection unit DSTC 190 mounted on a mountingbar DSRA at the rear of the cubicle.

Advant OCS units are connected to the MasterBus 300 physical link by means of a cable from the connection unit DSTC 190 to an IEEE 802.3 - 1985 transceiver. The transceiver is attached directly to the coaxial cable, see Figure 2-4.

The transceiver, AUI cable, trunk coaxial cable and repeaters for MasterBus 300 are commercially available products that conform with the IEEE 802.3 - 1985 standard. The Trunk Cable Attachment Set below includes such products as recommended by ABB.

Table 2-1. MasterBus 300 Hardware

Item	Identity	Ordering number
Communication board	DSCS 140	5752 0001 - EV
Cable	DSTK 126	2639 0582 - AY
Terminators for trunk coaxial cable, see pictures “T1” - Termnation Set, “T2” Termination Set and Ground Connection Set	5217 423 - 19 5217 423 - 20 5217 423 - 21 2166 1922 - 1	5730 030 - HY
Joining Set for trunk coaxial cable	In Line Connector	5752 0001 - ER
Transceiver	5751 029 - 1 and mounting details	5730 030 -VN
Tool Kit		5751 029 - 2

Trunk Cable Attachment Set

1. Access Unit (AU) interface cable with connectors
   a. 5 m cable length with DSTK 128 (2639 0582-BL)
   b. 15 m cable length with DSTK 129 (2639 0582-BM).
   c. AMP Transceiver **(Note: isolation must be > 2 kV)**
   d. Tap Connector Assembly Tool Kit.
2. PVC Coaxial Trunk Cable Set (for indoor use only)
   a. PVC Trunk cable with type N connectors, the length of the cable can be ordered in odd multiples of 23.4 m
   b. In-line connectors
   c. Line terminator T1 and T2

d. Ground clamp (2166 1922-1).

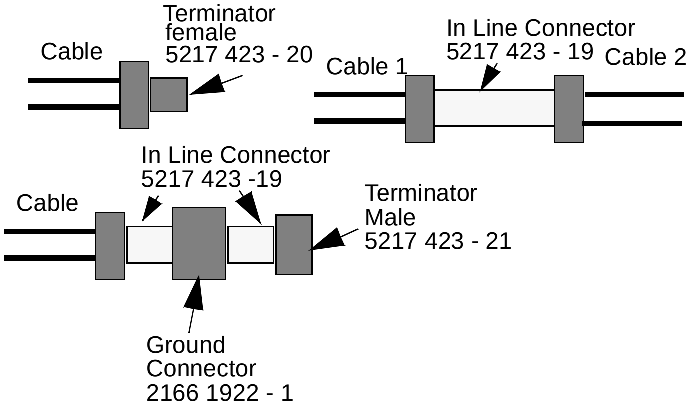


Figure 2-3. Terminators for Trunk Coaxial Cable

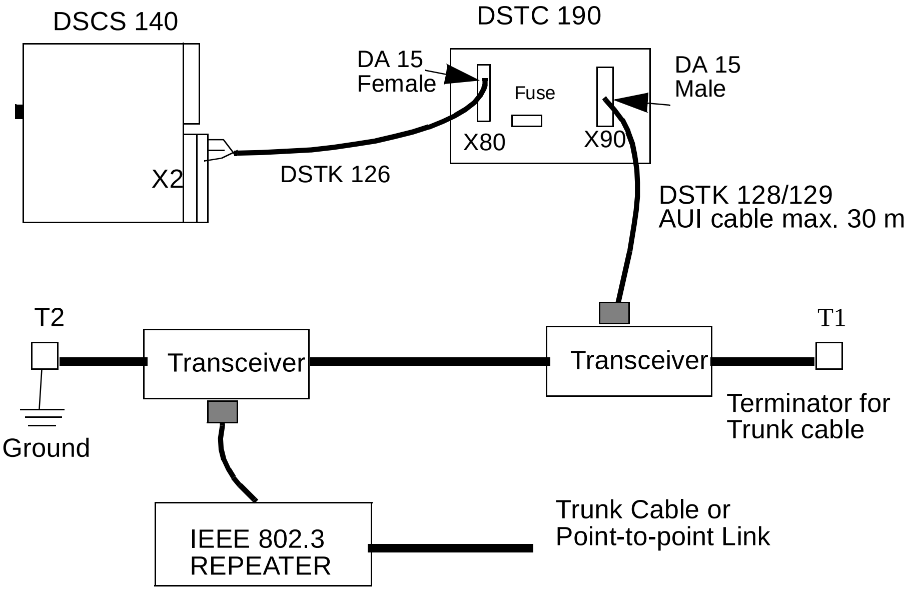


Figure 2-4. MasterBus 300 Hardware for MP 200/1, MV 800/1 and MG 230/1

2.2.2 MasterBus 300E Hardware in MP 200/1, MV 800/1 and MG 230/1

The only difference in hardware for MasterBus 300E, as compared with MasterBus 300 in Section 2.2.1, MasterBus 300 Hardware in MP 200/1, MV 800/1 and MG 230/1, is the communication board DSCS 145, which has a different ordering number (5752 0001-KX).

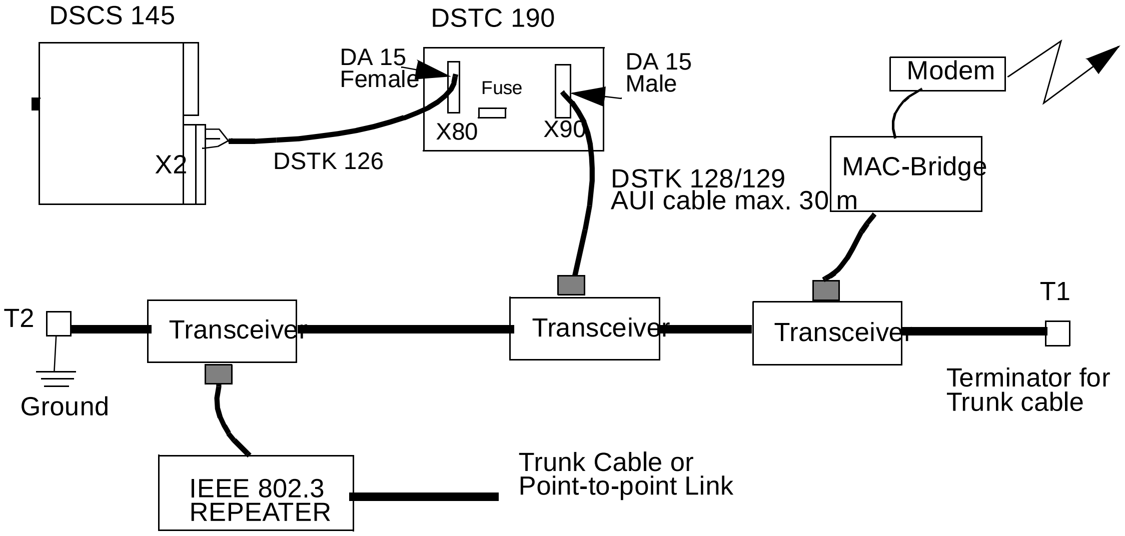


Figure 2-5. MB 300 Hardware for MP 200/1, MV 800/1 and MG 230/1

NOTE

Repeater set with coaxial or fiber optical point-to-point cable and Medium Access Control (MAC) Bridges must be in accordance with IEEE 802.3 specifications.

2.2.3 Strapping of DSCS 140/145

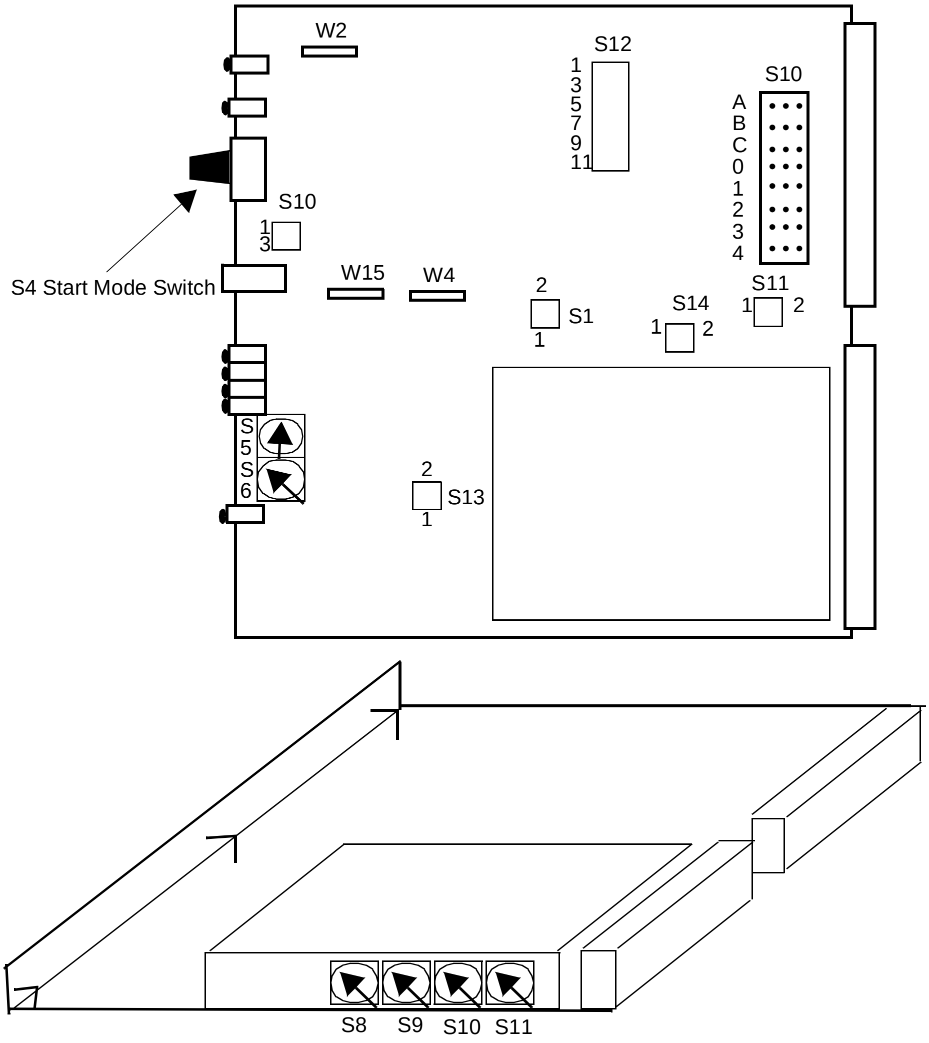


Figure 2-6. DSCS 140/145 Strap Groups

Test strap S1 and S13

S1 and S13 are test straps under factory test. Strap them 1-2, according to:

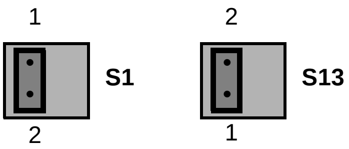


Figure 2-7. DSCS 140 Test Strap

Base address S3

With strap group S3, the DSCS 140 base address in the system memory map is defined.

DSCS 140/145 board 1:	S3 should be strapped to	57 HEX.
DSCS 140/145 board 2:	S3 should be strapped to	5F HEX.
DSCS 140/145 board 3:	S3 should be strapped to	67 HEX.
DSCS 140/145 board 4:	S3 should be strapped to	6F HEX.
DSCS 140/145 board 5:	S3 should be strapped to	77 HEX.
DSCS 140/145 board 6:	S3 should be strapped to	7F HEX.

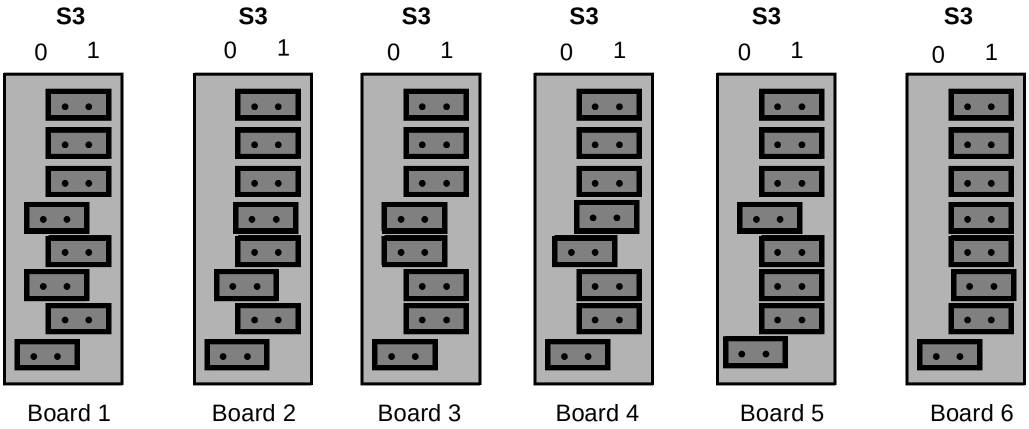


Figure 2-8. DSCS 140/145 Strapping

Interrupt level S10

With strap group S10, the interrupt level is defined. Strap S10 1-2, i.e, for IREQ1.

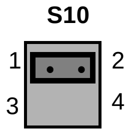


Figure 2-9. DSCS 140 Interrupt Level

Host processor type S11

Use strap group S11 to adapt DSCS 140/145 to the host processor. Strap S11 for host processor DSPC 170, i.e., 1 - 2.

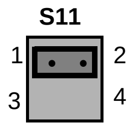


Figure 2-10. Host Processor Type

PROM/RWM S12

With this strap group, you determine whether or not memory sockets D112 and D113 are to contain RWM or PROM. Strap S12 for RWM, i.e., 5-6, 7-8, 11-12.

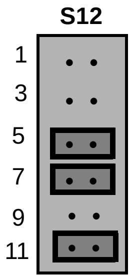


Figure 2-11. DSCS 140/145 PROM/RWM Support

Battery backup support S14

With strap group S14, you determine whether or not battery backup is supported. Strap S14 3-4, i.e., for battery backup.

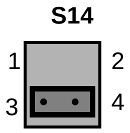


Figure 2-12. DSCS 140 Battery Backup Supported

Solder straps W2, W4, W15

DSCS 140/145 contains three solder straps which are factory set.

W4, W15 should be connected.

W2 should not be connected.

MasterBus 300/300E network and node address

The network and node number for MasterBus 300/300E are defined with switches S5, S6, S9 and S8, according to the following:

S5 defines bit 0-3 of the node number.

S6 defines bit 4-7 of the node number.

S9 defines bit 0-3 of the network number.

S8 defines bit 4-7 of the network number.

S10 and **S11** define the MAC frame size. Set them both to F (hex) to achieve variable frame size.

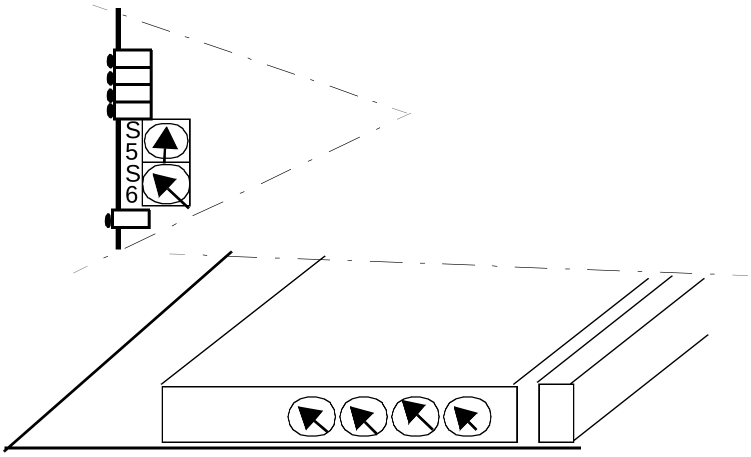


Figure 2-13. Node and Network Number

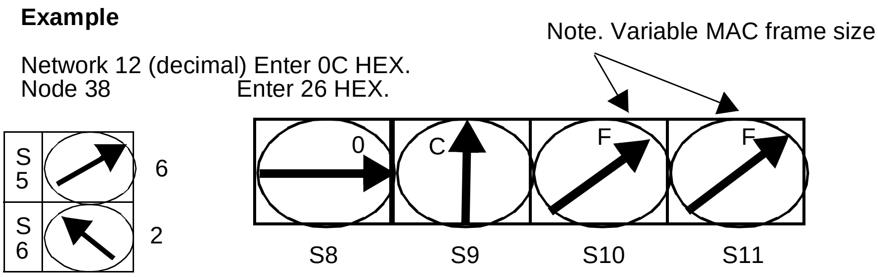

Example
Network 12 (decimal) Enter 0C HEX.
Node 38 Enter 26 HEX.
Note. Variable MAC frame size
S
5
6
S
6
2
0
C
F
F
S8
S9
S10
S11

Figure 2-14. Example of Network and Node Number Settings

MAC frame size

The DSCS 140 board can handle packet lengths of both variable and, for backward compatibility reasons, fixed size.

The switches S10 and S11 define whether fixed or variable MAC frame size is used. If they are set to F (hex), variable frame size is achieved. If the switches are set to 0 (hex), the MAC frame size is compatible with the older version of the DSCS 140.

This is implemented on the DSCS 140 board version 5752 0001-EV/8, with PROM marked 4911 014-ALU and 4911 014-ALV or later. The first version of DSCS 140 with this capability was released in mid-1990. You minimize overhead and better use the bandwidth of the bus if you use packet lengths of variable size.

If all of the DSCS 140 boards connected to one bus are of the version mentioned above or later, the S10 and S11 are preferably set to F (hex). If you want to connect a "new" node to an "old" bus, you must set the switches to 0 (hex). DSCS 145 must always have the switches S10 and S11 set to “F” (hex) so that variable MAC frame size is selected.

2.2.3.1 DSCS 140/145 Front Panel

START mode switch

Use this switch to define the DSCS 140 start-up mode. It should be in position 2, i.e., CLEAR, the normal operating position.

Use OFFLINE mode only during debugging or when stopping a board.

Table 2-2. Start Mode Switch Position

Switch position	Start up mode
2	CLEAR
3	OFFLINE

INIT switch

When activated, DSCS 140/145 starts up according to the position of the START switch. CLEAR means that connections are established.

CONSOLE (V24 connection)

Used in OFFLINE mode.

Indicators

DSCS 140/145 contains 14 LED indicators located on the front panel. A red LED indicates an error condition.

Table 2-3. LED Indicators on DSCS 140/145

Name	Defining	LED color
F	Fault	Red
HLDA	DMA access	Yellow
HLT	Halt	Red
STAL	Stall	Red
A1	Receive from network	Yellow
B1	Transmit to network	Yellow
A2 - B2	Not used	-
B2 - B4	Not used	-

Table 2-3. LED Indicators on DSCS 140/145 (Continued)

Name	Defining	LED color
R	Receive in OFFLINE mode	Yellow
T	Transmit in OFFLINE mode	Yellow

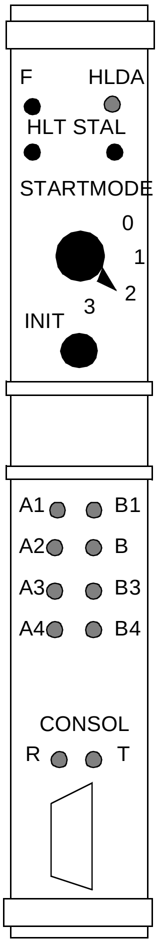


Figure 2-15. DSCS 140/145 Front Panel and Switches

2.2.4 MasterBus 300/300E Hardware in Advant Station 500 Series

The MasterBus 300/300E module CS503 is an Auxiliary module mounted on the Real-Time Accelerator board PU510. The Real-Time Accelerator board is installed in an EISA slot in the Advant Station 500 series.

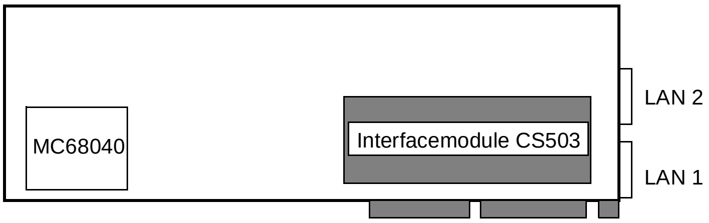


Figure 2-16. Real-Time Accelerator Board PU510

Connect the Advant Station to the transceiver on the trunk cable using one or two (if using a redundant network) AUI cables, please refer to Figure 2-17.

Table 2-4. AUI Cable for PU510

Item	Identity	Ordering number
AUI Cable, 5 m	TK526	3BSC 950 022R5
AUI Cable, 15 m	TK526	3BSC 950 022R15

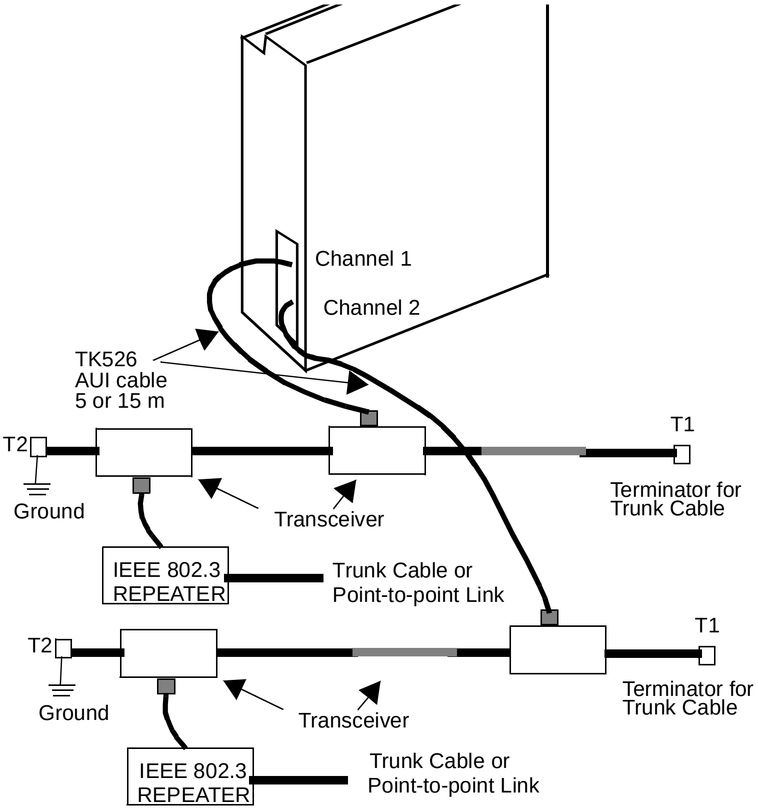


Figure 2-17. MasterBus 300/300E Physical Connection

2.2.5 MasterBus 300/300E Hardware for Advant Controller 410

Table 2-5. MasterBus 300 Hardware for Advant Controller 410

Item	Identity	Ordering number
Communication module	CS513	3BSE 000435
Terminators for trunk coaxial cable, see pictures "T1" - Termnation Set, "T2" Termination Set and Ground Connection Set	5217 423 - 19 5217 423 - 20 5217 423 - 21 2166 1922 - 1	5730 030 - HY
Joining Set for trunk coaxial cable	In Line Connector	5752 0001 - ER
Access Unit Interface cable (AUI) straight connector, 5 m length	DSTK 128	2639 0582 - BL
Access Unit Interface cable (AUI) straight connector, 15 m length	DSTK 129	2639 0582-BM
Access Unit Interface cable (AUI) angled connector, 5 m length	TK576V050	3BSC 950055R1
Access Unit Interface cable (AUI) angled connector, 15 m length	TK576V150	3BSC 950056R1
Transceiver	5751 029 - 1 and mounting details	5730 030 -VN
Tool Kit		5751 029 - 2

Trunk Cable Attachment Set

1. Access Unit (AU) interface cable with connectors
    a. 5 m cable length with DSTK 128 (2639 0582-BL)
    b. 15 m cable length with DSTK 129 (2639 0582-BM)
    c. 5m cable length with TK576V050 (3BSC950055R1) (Note the connector on the CS513 side is angled.)
    d. 15 m cable length with TK576V150 (3BSC950056R1) (Note the connector on the CS513 side is angled.)
    e. AMP Transceiver **(Note: isolation must be > 2 kV)**
    f. Tap Connector Assembly Tool Kit

2. PVC Coaxial Trunk Cable Set (for indoor use only)
    a. PVC Trunk cable with type N connectors, the length of the cable can be ordered in odd multiples of 23.4 m
    b. In-line connectors
    c. Line terminator T1 and T2
    d. Ground clamp (2166 1922-1)

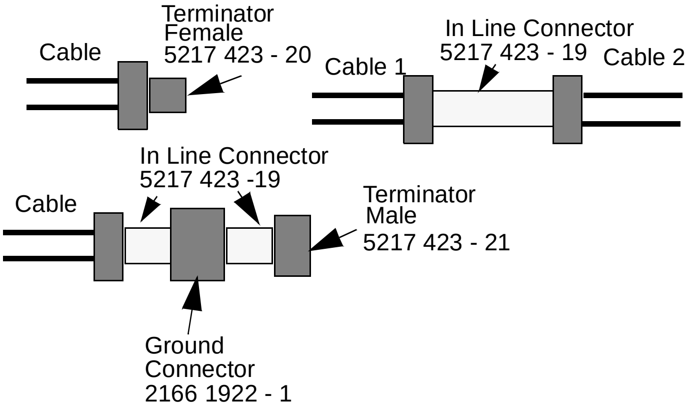


Figure 2-18. Termination Set for Trunk Coaxial Cable

2.2.5.1 CS513 Small Circuit Board adapted to the Module Interconnection Bus (MIB)

CS513 is a small circuit board adapted to the Module Interconnection Bus (MIB) and intended for insertion in various processor boards such as Advant Controller 410, SC510 and SC520. The board contains an Integrated Local Area Communication Controller which realizes the physical level of communication defined in the standard IEEE 802.3.

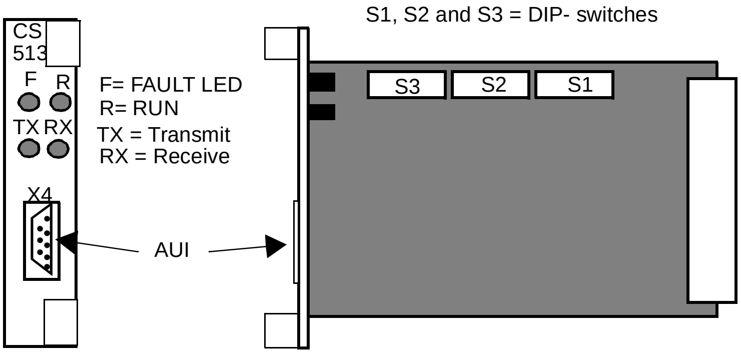


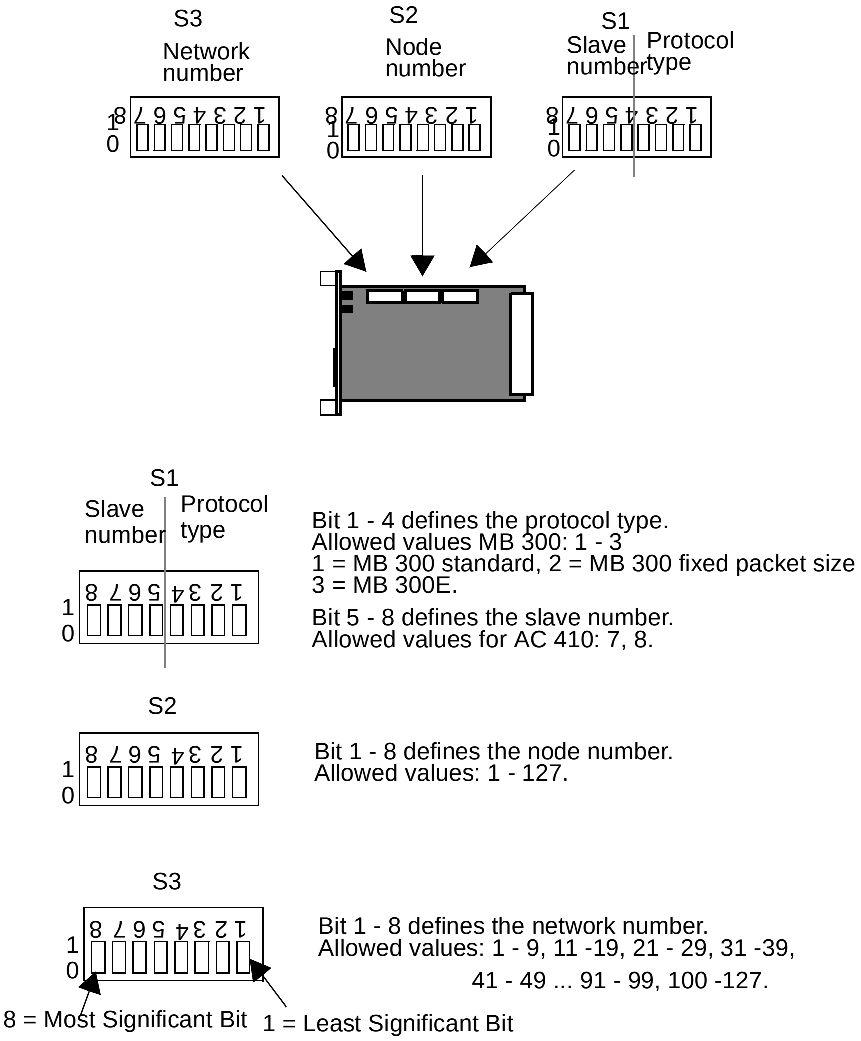
Figure 2-19. CS513

Strappings

Use the strap group S1 to select protocol type and slave number.

Use the strap group S2 to select node number.

Use the strap group S3 to select network number.



Bit 1 - 4 defines the protocol type.
Allowed values MB 300: 1 - 3
1 = MB 300 standard, 2 = MB 300 fixed packet size
3 = MB 300E.

Bit 5 - 8 defines the slave number.
Allowed values for AC 410: 7, 8.

Bit 1 - 8 defines the node number.
Allowed values: 1 - 127.

Bit 1 - 8 defines the network number.
Allowed values: 1 - 9, 11 -19, 21 - 29, 31 -39,
41 - 49 ... 91 - 99, 100 -127.

Figure 2-20. CS513 Strap Groups

Please, read page 2-30 for examples.

Mount the IEEE 802.3 communication module CS513 in one or two of the slots in processor module PM 150.

NOTE

You can insert the module in any one of the four slots, but it must have the slave number 7 or 8 when mounted in Advant Controller 410.

2.2.5.2 LAN Data Base Element

The values strapped on the CS513 communication module are transferred by the system and are reflected in the Data Base Element for CS513 LANx. Errors are reported as a value on the ERRTYPE terminal, see Figure 2-40.

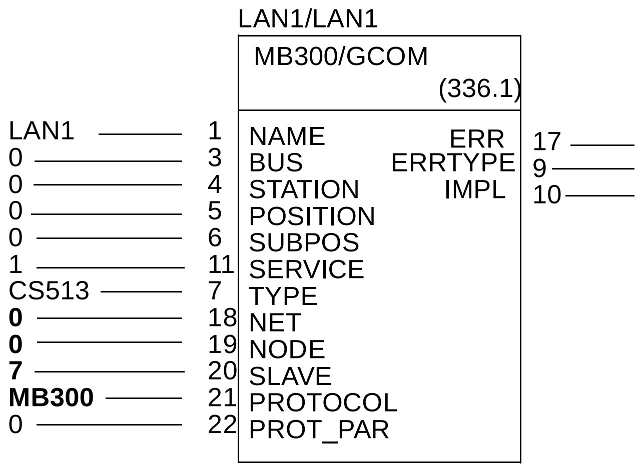


Figure 2-21. CS513 Data Base Element (LAN)

Connect the ABB Advant Controller 410 to the MasterBus 300 physical link by means of the AUI cable from the X4 contact on the CS513 communication module to an IEEE 802.3 - 1985 transceiver. Attach the transceiver directly to the coaxial cable, see Figure 2-22.

CAUTION

Always disconnect the transceiver cable from the X4 contact of CS513 before inserting or removing the CS513.

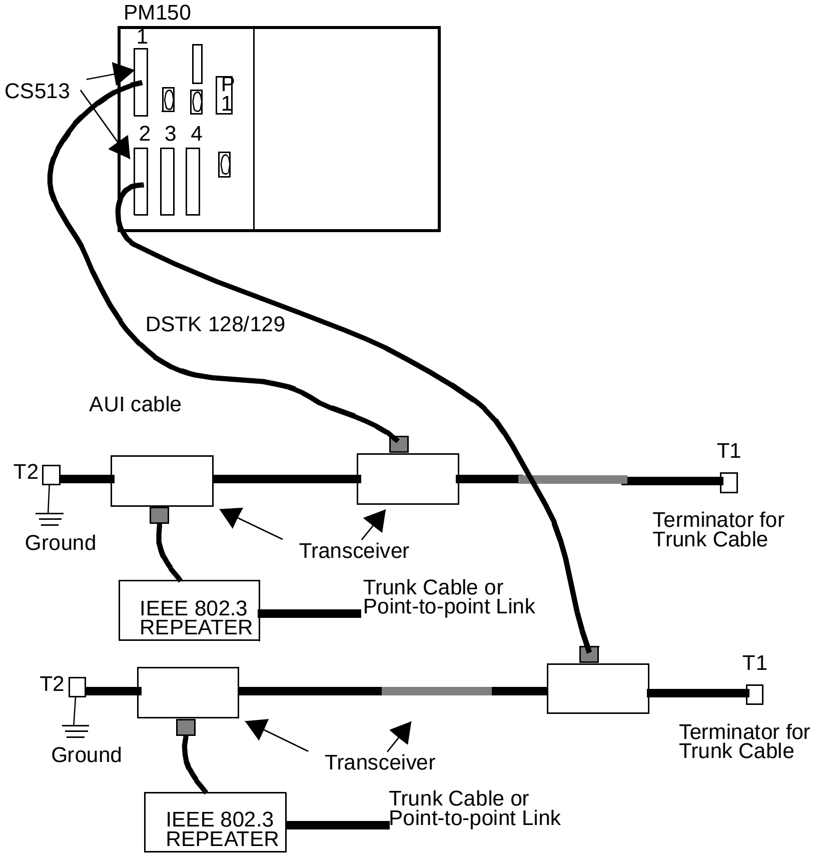

PM150
1
CS513
2 3 4
P
1
DSTK 128/129
AUI cable
T2
Ground
Transceiver
T1
Terminator for Trunk Cable
IEEE 802.3 REPEATER
Trunk Cable or Point-to-point Link
T2
Ground
Transceiver
T1
Terminator for Trunk Cable
IEEE 802.3 REPEATER
Trunk Cable or Point-to-point Link

Figure 2-22. MB 300/300E Hardware in Advant Controller 410

The transceiver, AUI cable, trunk coaxial cable and repeaters for MasterBus 300 are commercially available products that conform with the IEEE 802.3 - 1985 standard. The Trunk Cable Attachment Set includes such products as recommended by ABB.

2.2.6 MasterBus 300/300E Hardware for Advant Controller 450

Table 2-6. MasterBus 300 Hardware for Advant Controller 450

Item	Identity	Ordering number
Communication module	CS513	3BSE 000435
Carrier board	SC510(1)	3BSE 003832
Carrier board	SC520(1)	3BSE 003816
Carrier board	SC530	3BSE 003817

Table 2-6. MasterBus 300 Hardware for Advant Controller 450 (Continued)

Item	Identity	Ordering number
Terminators for trunk coaxial cable, see pictures "T1" - Termnation Set, "T2" Termination Set and Ground Connection Set	5217 423 - 19 5217 423 - 20 5217 423 - 21 2166 1922 - 1	5730 030 - HY
Joining Set for trunk coaxial cable	In Line Connector	5752 0001 - ER
Access Unit Interface cable (AUI) straight connector, 5 m length	DSTK 128	2639 0582 - BL
Access Unit Interface cable (AUI) straight connector, 15 m length	DSTK 129	2639 0582-BM
Access Unit Interface cable (AUI) angled connector, 5 m length	TK576V050	3BSC 950055R1
Access Unit Interface cable (AUI) angled connector, 15 m length	TK576V150	3BSC 950056R1
Transceiver	5751 029 - 1 and mounting details	5730 030 -VN
Tool Kit		5751 029 - 2

(1) Carrier board SC 510 and SC 520 cannot be used for GCOM. GCOM uses carrier board SC 530.

Trunk Cable Attachment Set

1. Access Unit (AU) interface cable with connectors
    a. 5m cable length with TK576V050 (3BSC950055R1)
    (Note the connector on the CS 513 side is angled.)
    b. 15 m cable length with TK576V150 (3BSC950056R1)
    (Note the connector on the CS513 side is angled.)
    c. 5 m cable length with DSTK 128 (2639 0582-BL)
    d. 15 m cable length with DSTK 129 (2639 0582-BM)
    e. Transceiver **(Note: isolation must be > 2 kV)**
    f. Tap Connector Assembly Tool Kit.

2. PVC Coaxial Trunk Cable Set (for indoor use only)
   a. PVC Trunk cable with type N connectors, the length of the cable can be ordered in odd multiples of 23.4 m
   b. In-line connectors
   c. Line terminator T1 and T2
   d. Ground clamp (2166 1922-1).

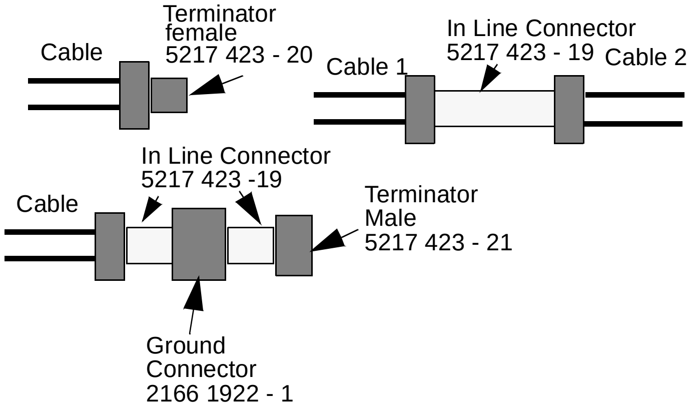


Figure 2-23. Termination Set for Trunk Coaxial Cable

2.2.6.1 CS513 Small Circuit Board adapted to the Module Interconnection Bus (MIB)

CS513 is a small circuit board adapted to the Module Interconnection Bus (MIB) and intended for insertion in various processor boards such as Advant Controller 410, SC510, SC520 and SC 530 (GCOM). The board contains an Integrated Local Area Communication Controller which realizes the physical level of communication defined in the IEEE 802.3 standard.

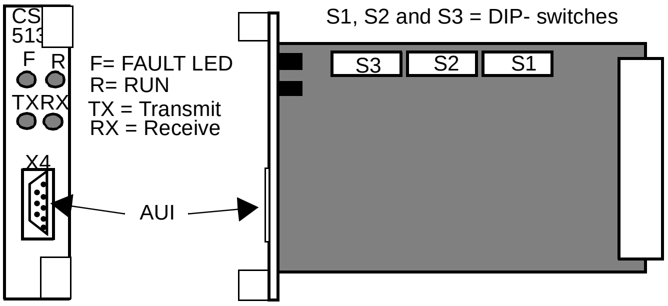


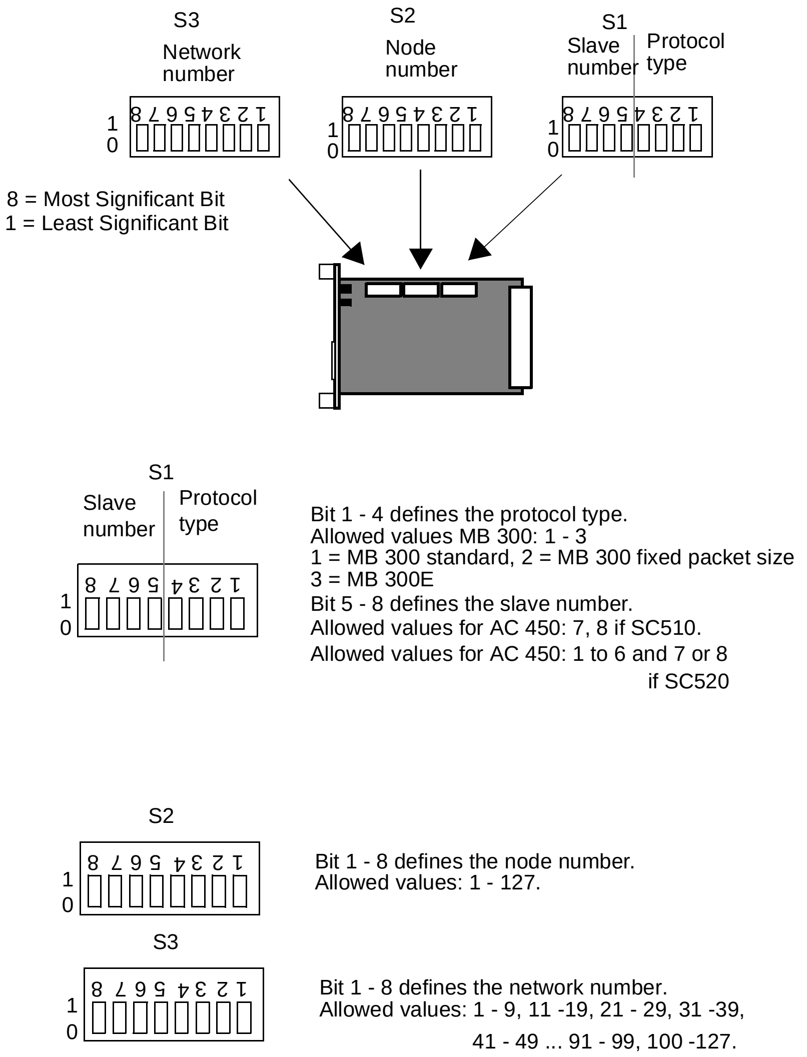
Figure 2-24. CS513

Strappings

Use the strap group S1 to select protocol type and slave number.

Use the strap group S2 to select node number.

Use the strap group S3 to select network number.



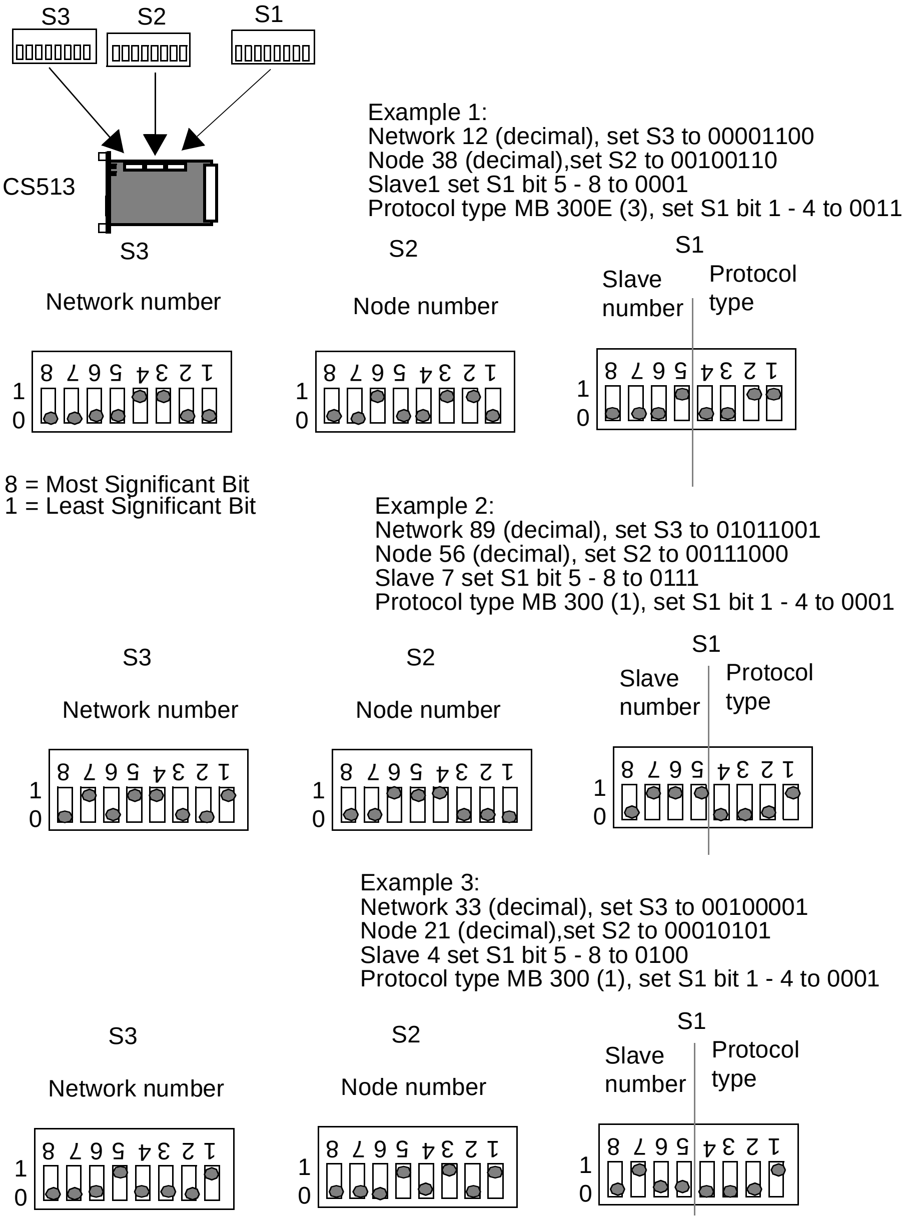
8 = Most Significant Bit
1 = Least Significant Bit

Bit 1 - 4 defines the protocol type.
Allowed values MB 300: 1 - 3
1 = MB 300 standard, 2 = MB 300 fixed packet size
3 = MB 300E
Bit 5 - 8 defines the slave number.
Allowed values for AC 450: 7, 8 if SC510.
Allowed values for AC 450: 1 to 6 and 7 or 8 if SC520

Bit 1 - 8 defines the node number.
Allowed values: 1 - 127.

Bit 1 - 8 defines the network number.
Allowed values: 1 - 9, 11 -19, 21 - 29, 31 -39, 41 - 49 ... 91 - 99, 100 -127.

Figure 2-25. CS513 Strap Groups



8 = Most Significant Bit
1 = Least Significant Bit

Example 1:
Network 12 (decimal), set S3 to 00001100
Node 38 (decimal),set S2 to 00100110
Slave1 set S1 bit 5 - 8 to 0001
Protocol type MB 300E (3), set S1 bit 1 - 4 to 0011

Example 2:
Network 89 (decimal), set S3 to 01011001
Node 56 (decimal), set S2 to 00111000
Slave 7 set S1 bit 5 - 8 to 0111
Protocol type MB 300 (1), set S1 bit 1 - 4 to 0001

Example 3:
Network 33 (decimal), set S3 to 00100001
Node 21 (decimal),set S2 to 00010101
Slave 4 set S1 bit 5 - 8 to 0100
Protocol type MB 300 (1), set S1 bit 1 - 4 to 0001

Figure 2-26. CS513 Strappings Example

CAUTION

Always disconnect the transceiver cable (DSTK 128/129) from the X4 contact of CS513 before inserting or removing CS513.

2.2.6.2 LAN Data Base Element

The values strapped on the CS513 communication module are transferred by the system and are reflected in the Data Base Element for CS513 LANx. Errors are reported as a value on the ERRTYPE terminal, see Figure 2-40. The terminal PROT_PAR is only used when the PROTOCOL = GCOM (GCOM standard). PROT_PAR is used to tune the time-out times when GCOM is used for communication via bridges, which introduces delays and limits the bandwidth.

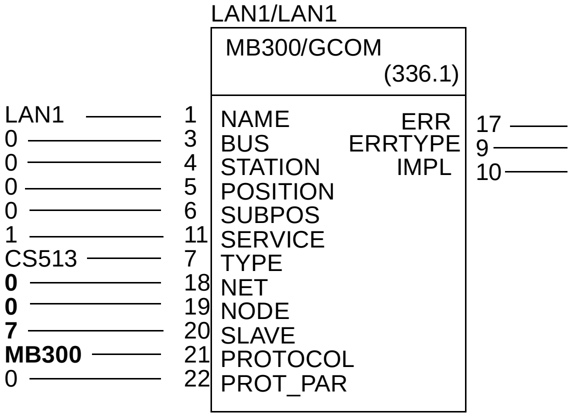


Figure 2-27. CS513 Data Base Element (LAN)

2.2.6.3 SC510 Rack-Mounted Circuit Board

SC510 is a rack-mounted circuit board, adapted to the FB+ back-plane bus.

The function of SC 510 is to act as a carrier for different kinds of I/O-modules, such as:

- communication modules for MasterBus 300/300E, CS513 (LAN IEEE 802.3)
- asynchronous communication modules for CI530 series, RCOM, MVI, RS-232-C, MasterFieldbus or Advant Fieldbus 100
- memory card interface board for system software, MB510 (PCMCIA)
- communication modules for GCOM IEEE 802.3, CI543.

SC510 has no intelligence to manage any I/O boards or modules, so they must be initialized and/or controlled by the host or themselves, i.e., the MasterBus 300/300E protocol stack software is run in the host CPU.

The board has mechanical provisions for two I/O-modules, both inserted from the front of the SC510. You can remove or change the I/O-modules without removing the base board from the FB+ back-plane.

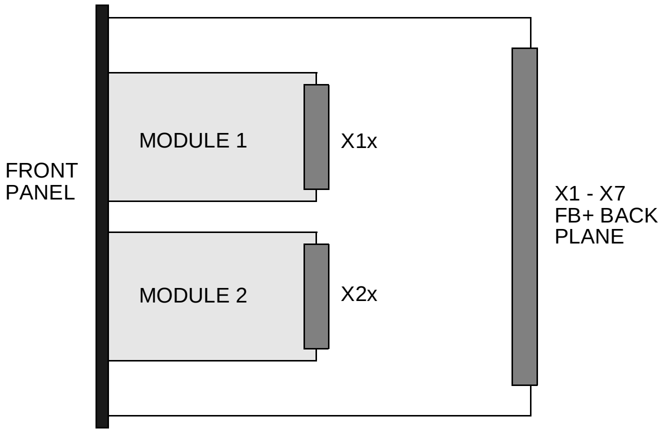


Figure 2-28. SC 510 Connectors

CONNECTORS X1 - X7

The rear connectors, X1-X7, contain the connections to the FB+ back-plane.

X1x and X2x

These connectors on the base board, accessible through the front, are the connectors to the Module Interconnection Bus, MIB. The connector designated X1x corresponds to the module position 1 and X2x to module position 2. Module 1 is the upper module, as viewed from the front, and Module 2 is the lower, see Figure 2-28.

Strappings

There are no strappings for this board.

MasterBus 300 on SC510

SC 510 is the submodule carrier intended for communication via the MasterBus 300 or 300E protocol, running the selected protocol stack for two CS513 modules in the host CPU by assigning the slave number 7 or 8 to the modules.

NOTE

You can run a maximum of two communication protocol stacks in the host CPU, type MasterBus 300 or MasterBus 300E, or one MasterBus 300 and one MasterBus 300E.

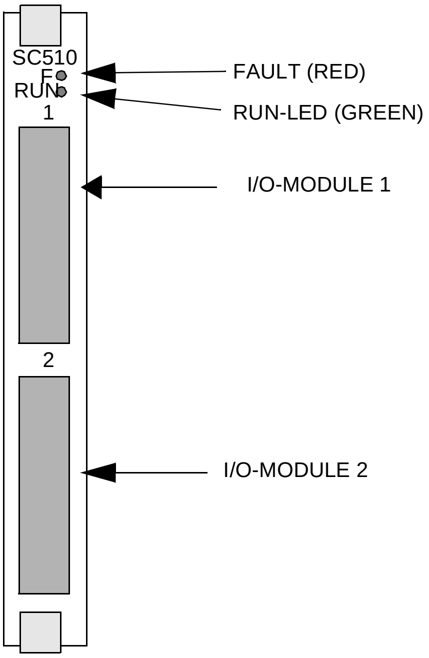


Figure 2-29. SC510

2.2.6.4 SC520 Rack-Mounted Circuit Board

SC520 is a rack-mounted circuit board, adapted to the FB+ back-plane bus. **The board contains a CPU and memory.**

The function of SC 520 is to act as an intelligent carrier for different kinds of I/O-modules, such as:

- communication modules for MasterBus 300/300E, CS513 (LAN IEEE 802.3)
- asynchronous communication modules for CI530 series, RCOM, MVI, RS-232-C, MasterFieldbus or Advant Fieldbus 100
- memory card interface board for system software, MB510 (PCMCIA)
- communication modules for GCOM IEEE 802.3, CI543.

You can execute higher level software that relieves the host CPU in the system of handling I/O at the lowest level, i.e., in the case of MasterBus 300/300E, communication parts of the protocol stack software are run on the SC520 board CPU.

The board has mechanical provisions for two I/O-modules, both inserted from the front of the SC520. You can remove or change the I/O-modules without removing the base board from the FB+ back-plane.

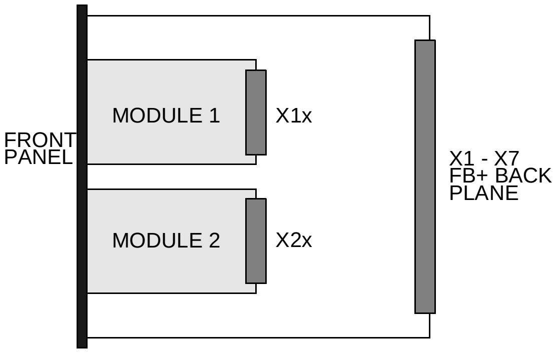


Figure 2-30. SC520 Connectors

CONNECTORS X1 - X7

The rear connectors, X1-X7, contain the connections to the FB+ back-plane.

X1x and X2x

These connectors on the base board, accessible through the front, are the connectors to the Module Interconnection Bus, MIB. The connector designated X1x corresponds to the module position 1 and X2x to module position 2. Module 1 is the upper module, as viewed from the front, and Module 2 is the lower module. See Figure 2-30.

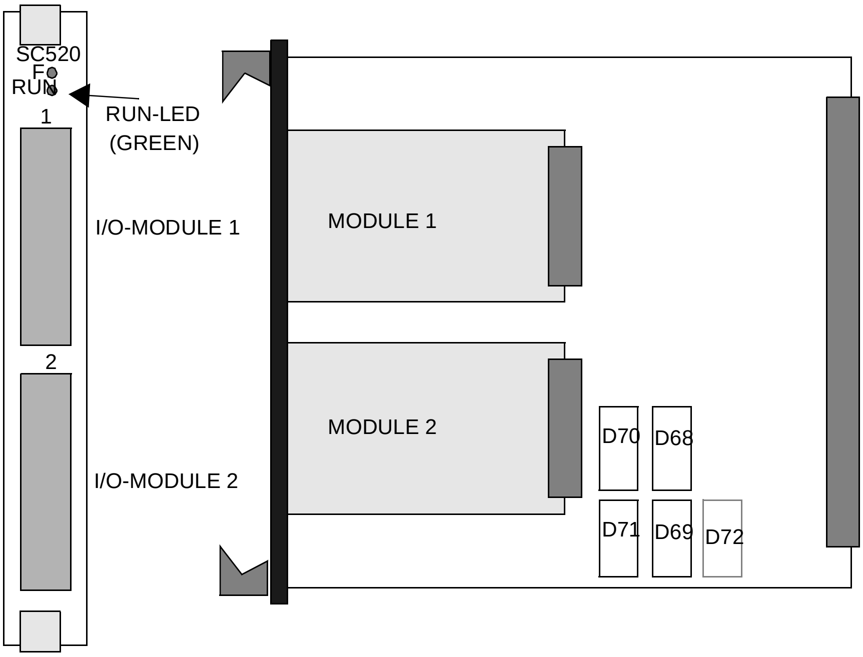


Figure 2-31. SC520 Sockets for PROM

PROM locations

The SC520 board has five sockets for PROM located near the lower edge of the board, see Figure 2-31. Four sockets (D68 - D71) are intended for the "main program memory" and the fifth socket (D72) is intended for BOOT PROM, if any. SC520 does not have any BOOT PROM.

Strappings

There are no strappings for this board.

MasterBus 300 on SC520

SC520 is the submodule carrier intended for communication via the MasterBus 300 or 300E protocol, running the selected protocol stack for two CS513 modules on the board itself by assigning slave numbers 1-6 to the modules. It is also possible to assign the slave number 7 or 8 to one of the modules and thereby run the MasterBus 300 or 300E protocol stack in the host CPU (see Section 2.2.6.3, SC510 Rack-Mounted Circuit Board).

NOTE

You cannot run the same protocol in the host CPU (slave number 7 or 8) as selected for the SC520, i.e., if you choose to run MasterBus 300 on the SC520 (slave numbers 1-6), then you can only run MasterBus 300E in the host CPU (slave number 7 or 8) and vice versa.

2.2.7 MasterBus 300/300E and GCOM IEEE 802.3 Physical Installation

You can connect one (1) MasterBus 300 from one DSCS 140 board or one (1) MasterBus 300E from one DSCS 145 board. Connect DSCS 140/145 to connection unit DSTC 190 via the cable DSTK 126. The AU-interface cable (DSTK 128/129) connects the DSTC 190 X90 contact to the transceiver.

The communication module CS513 can communicate via one MasterBus 300, MasterBus 300E or GCOM bus, depending on the protocol specified with its S1 DIP switch. The AU-interface (TK576) cable connects CS513 directly to the transceiver via the X4 contact.

Follow the instructions below:

- Use a maximum of 45 stations on MasterBus 300/300E in a Control Network.
- Use a maximum of four stations on GCOM IEEE 802.3 on one network.
- Use a maximum AU-interface cable length of 30 m.
- Use a maximum bus length of 500 m without repeaters.
- Install the transceiver only on the 2.5 m mark on the 10Base5 trunk cable. The spacing between two transceivers on a coaxial cable segment (between two line terminators) must be an integral multiple of 2.5 m.
- Note that you must isolate the transceiver from ground (cable tray) to avoid decreasing the electrical interference immunity. The distance between the transceiver and the nearest ground (cable tray) must be at least 100 mm. Please refer to Figure 2-32.

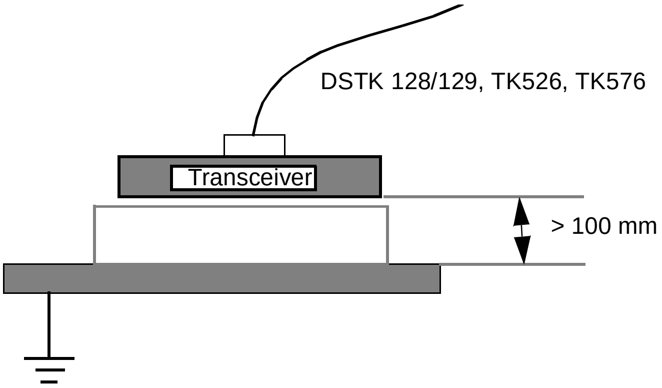


Figure 2-32. Transceiver Isolation

- The transceiver connection to the coaxial cable must present a predictably low shunt capacitance, and so a negligibly short stub length. Locate the transceiver as close to its cable connections as possible. Long (greater than 30 mm) connections between the coaxial cable and the input of the transceiver jeopardize this objective.
- ABB recommends a piercing tap connector without severing the cable.

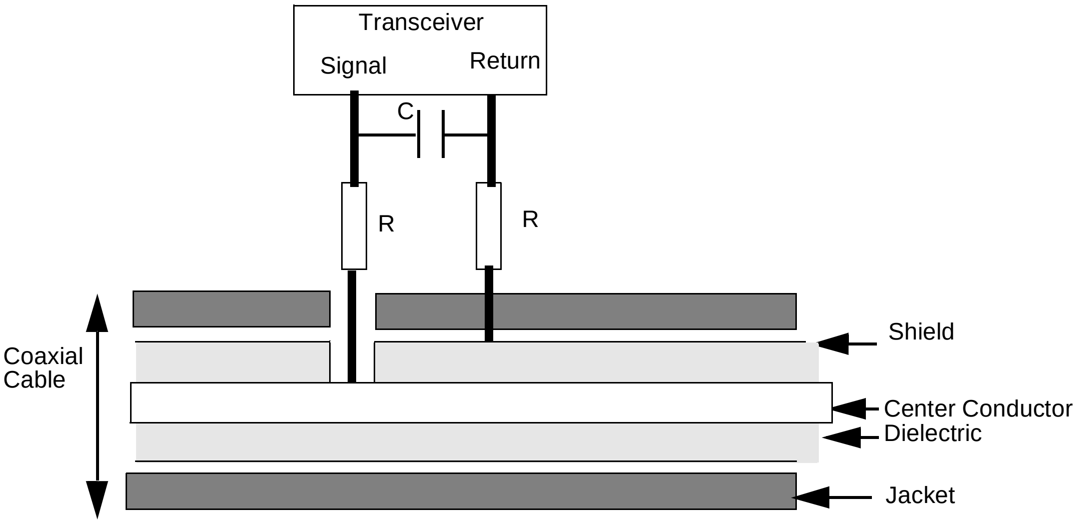


Figure 2-33. Coaxial Tap Connection

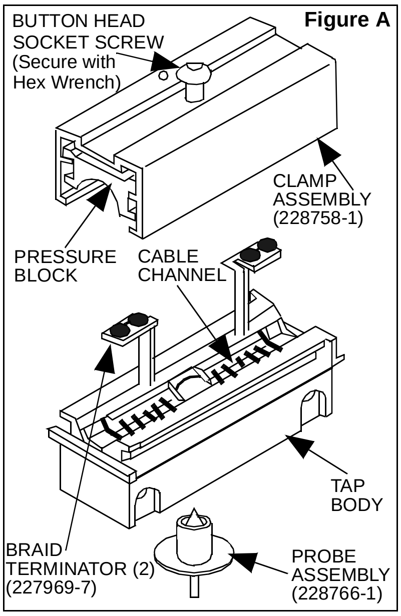


Figure A
BUTTON HEAD SOCKET SCREW (Secure with Hex Wrench)
CLAMP ASSEMBLY (228758-1)
PRESSURE BLOCK
CABLE CHANNEL
TAP BODY
BRAID TERMINATOR (2) (227969-7)
PROBE ASSEMBLY (228766-1)

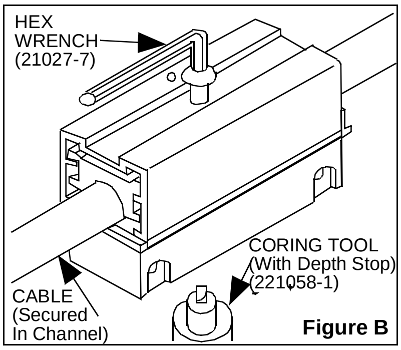


Figure B
HEX WRENCH (21027-7)
CORING TOOL (With Depth Stop) (221058-1)
CABLE (Secured In Channel)

1. INTRODUCTION

This instruction sheet (IS) covers installation of the AMP Coaxial Active Tap Kit 228752-1, designed for low profile application. See Figure A.

Read the material thoroughly before starting assembly.

2. DESCRIPTION (Figure A)

Each kit consists of a clamp assembly, a tap body, two braid terminators, a probe assembly, and a protective dust cover (not shown). See Figure A.

The clamp assembly has a frame that slides onto the tap body, a pressure block that holds the cable in place, and a button head socket screw. The tap body features a cable channel that retains the cable and an internal guide slot to accept a pc board. The two braid terminators are designed to penetrate the cable jacket and provide a positive ground. The probe assembly features a spring-loaded contact, and threads into the tap body, ensuring permanent contact with the center conductor.

Tools required are a hex wrench, a coring tool, and a socket wrench (AMP Installation Tool Kit 228917-1 is

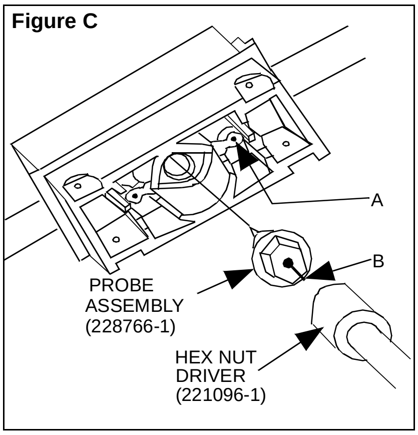


Figure C

3. ASSEMBLY PROCEDURE

1. Determine tapping location on cable.
2. Insert braid terminators into tap body. (Figure A).
3. Locate cable in cable channel of tap body.
4. Slide clamp assembly onto tap body (figure).
5. Using hex wrench, thread button head socket screw into frame until pressure block bottoms on track and holds cable securely. See Figure B.
6. Using coring tool 221058-1, drill through cable to center conductor. Notice that the coring tool has a stop to prevent overdrilling.
7. Inspect hole to be sure no particles of shield or other matter remain in hole; then, using hex nut driver 221096-1, thread probe assembly into tap body until probe assembly bottoms (Figure C).
8. Align probe and braid terminator posts with contacts on pc board, then place tap on pc board.
9. Secure tap body to pc board with screws and nuts, rivets, or other suitable hardware. See Figure D.

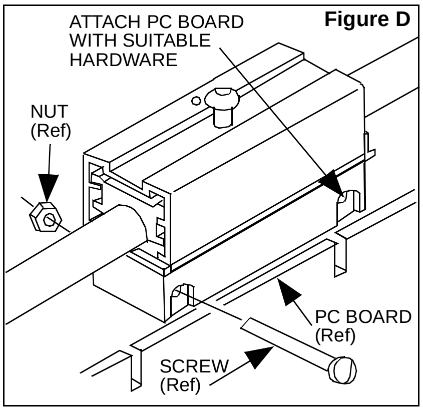


Figure D

TRADEMARK OF **AMP** INCORPORATED

Figure 2-34. Installation of Transceiver

- Overall performance of the LAN communication depends to a large extent on the reliability of the coaxial cable medium and the connection to that medium. Tap connection should consider the relevant electrical and mechanical parameters at the point of electrical connection between tap probe and cable center conductor to ensure that a reliable contact is made and retained throughout the useful life of these components. Follow the instructions included with the transceiver. Between point A and B in Figure 2-34, measure 25 ± 3 Ω with both terminators connected.

NOTE

The transceiver must be strapped for the heart beat test (SQE).

- Effectively ground the shield conductor of each coaxial cable segment using the ground clamp at only one point along the length of the cable. The ground clamp **must not make electrical contact with ground potential elsewhere**. Connect the ground clamp to earth via a cable with a maximum length equal to 10 m and a minimum diameter equal to 4 sq. mm. Use insulators to cover any coaxial in-line connector and terminator.
- Connect the sheet conductor of the AU interface cable to the chassis of the Advant OCS station Advant Station 500 series and Advant Controller 400 series.
- Terminate both ends of the trunk cable in order to minimize reflections from the ends of the cable. If the cable is supplied from ABB, both ends are supplied with a type N connector, which you should connect to the line terminator or to the in-line connector. Measuring between center conductor and shield, you can see 50 Ω with one terminator connected. Perform this at both ends.
- If you plan to install local repeaters or remote repeaters with a point-to-point link segment, please refer to the supplier's installation guide.
- Route the trunk coax cable and the transceivers on cable trays with respect to distances to other cables. (Minimum distance is 30 cm.) Route the coax cable together with Advant OCS cables, according to information in the manual *Advant® OCS Installation Rules*.
- Do not bend the trunk cable in a radius of less than 20 cm. Note that neither transceivers nor PVC trunk cables can be routed in air ducts used for ventilation because of problems with water condensation.
- Route the AU interface cable (DSTK 128/129, TK526 or TK576) within the cabinet together with communication cables with shield according to *Advant® OCS Installation Rules*.
- Use the following alternatives for trunk cable installations between buildings:
  - Fiber optical link segments with repeaters or fiber optical transceivers.
  - Coax cable for outdoor use routed in a metal tube together with a 35 sq. mm earth wire along the tube. The tube is connected to ground at least at both ends. Note that the coax cable must be installed in cable ducts with a minimum depth of 80 cm. The distance to other cables in the duct must be at least 30 cm. A separate overvoltage protection device is not used.

2.2.8 Communication Parameters for AS 500, AC 410, and AC 450

2.2.8.1 Advant Station 500 Series

All MasterBus 300 communication parameters are assigned default values. These values are sufficient in almost all ABB MasterBus 300 installations, so you do not need to give the corresponding Data Base Element values. It is possible, however, possible to read these values even if, in most cases, they are of little interest.

In a few installations, it may be necessary to tune the network. In order to tune the network, you need Network Management or System & Data Base Command Processors, and a deeper knowledge of the MasterNet characteristics. This service is only available as an expert tool and is not defined in this document.

LAN Data Base Element

The applicable values defined in communication Data Base Elements are transferred by the system and are reflected in the Data Base Element for LAN1/LAN2. Errors are reported as values on the ERRTYPE terminal, see Table 2-8.

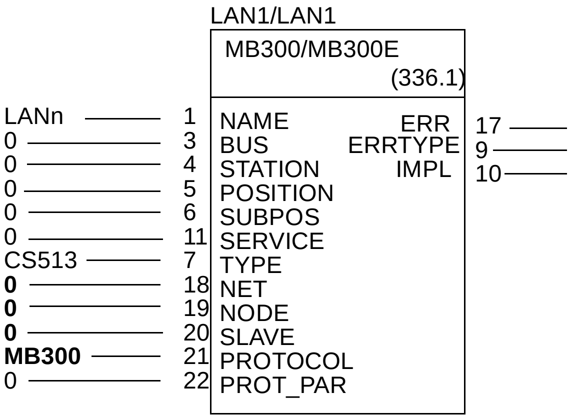


Figure 2-35. LAN Data Base Element

Table 2-7. Properties for the LAN DataBase Element

Terminal no.	Terminal name	Value entered by	Default value	Description
1	NAME	System	LANn (n = 1 or 2)	Unique name of Data Base Element
3	BUS	Not Applicable	0	Not implemented
4	STATION	Not Applicable	0	Not implemented

Table 2-7. Properties for the LAN DataBase Element (Continued)

Terminal no.	Terminal name	Value entered by	Default value	Description
5	POSITION	System	0	In AS 500, always 0
6	SUBPOSITION	System	1 or 2	LAN channel number
7	TYPE	System	CS513	HW type of LAN module
9	ERRTYPE	System	00	Error type see table 00 = no error
10	IMPL	System	-	This flag is set to TRUE when communication is running and set to FALSE when communication is stopped.
11	SERVICE	System/ User	-	This property is set to 1 when the communication is started. If it is set to 0 by the user, the communication stops.
17	ERR	System	0	Error flag which is set when an error is detected
18	NET	User	-	Network number
19	NODE	User	-	Node number
20	SLAVE	System	0	Not applicable in AS 500 series.
21	PROTOCOL	System	MB 300 (01 = MB 300 02 = MB 300_F 03 = MB 300_E)	Protocol type, can be of type MB 300 (variable MAC PDU size), MB 300_F (fixed MAC PDU) or MB 300E
22	PROT_PAR	User	0	Not applicable in AS 500.

Table 2-8. AS 500 Error Codes from LANx Data Base Element

Type	Code	Interpretation
ermacaddr	21	Duplicate node number on the network
ernode	22	More than one node number defined in the station
ercntnet	23	Station connected to more than one Control Network
ernetw	25	Network number already used in Control Network
erinit	33	Start up of the LAN controller failed
erhw	34	Suspected hardware error
erhbt	39	Heart beat (SQE) error from LAN transceiver (lost contact with the transceiver)

The Network Layer Data Base Element

Summary

The network layer Data Base Element contains parameters for selecting protocol and parameters for the network dynamic routing scheme. All parameters are defined separately for each of the two LAN channels.

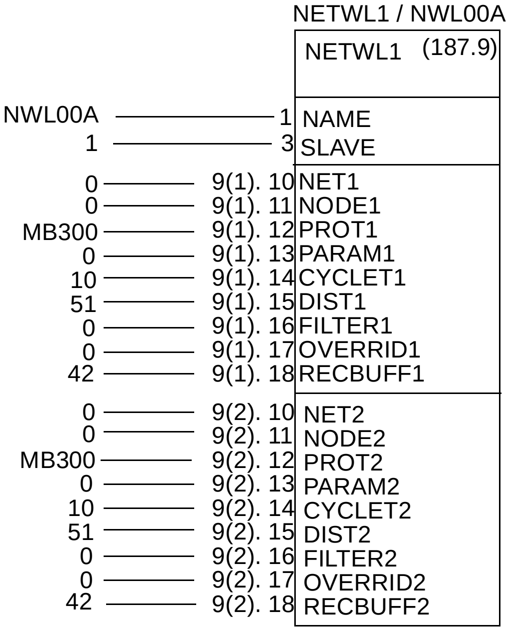


Figure 2-36. Network Layer DB Element

Head:

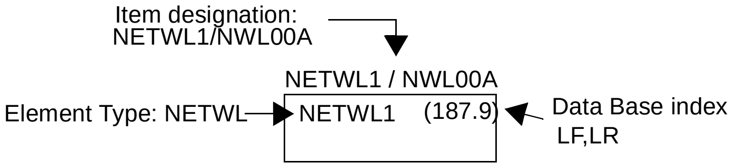


Figure 2-37. Head of Network Layer DB Element

Table 2-9. Properties for the Data Base Element NETWL1

Terminal no.	Terminal name	Value entered by	Default value	Description
1	NAME	System	NETWL1	Unique name of DB
2	SLAVE	System	1	Slave number
9(1).10	NET1	System	0	Network number for channel 1. This value is normally taken from a configuration file in the UNIX environment.
9(1).11	NODE1	System	0	Node number for channel 1. This value is normally taken from a configuration file in the UNIX environment.
9(1).12	PROT1	System/ User	MB 300	Protocol type for this channel. The following protocols are available: MB 300 (value=1) Standard MB 300 MB 300_F(value=2) MB 300 using fixed packet size MB 300_E (value=3) MB 300 Extended
9(1).13	PARAM1	System	0	Not used
9(1).14	CYCLET1	System/ User	10	Routing transmit cycle time. With this property, the generation of routing messages sent on the network can be controlled. Default value 10 generates one message per second. Range 10...127.

Table 2-9. Properties for the Data Base Element NETWL1 (Continued)

Terminal no.	**Terminal name**	**Value entered by**	**Default value**	**Description**
9(1).15	DIST1	System	51	Distance table size. A table of distances to every neighbor node.
9(1).16	FILTER1	System	0	With this property, the maximum distance can be reduced. Distance (1..7) is defined as "1+2*(number of intermediate nodes)" between two communicating nodes. The default value for FILTER1= 0, i.e., no reduction of the maximum distance. If distance is reduced in an intermediate node, then the maximum distance is automatically reduced in all end nodes (with OVERRIDE1=0, see below) which communicates via the intermediate node. Allowed values (1...7). **This property is not valid for MB 300E.**
9(1).17	OVERRID1	System	0	With this property, it is possible for a communicating end node to specify that the FILTER1 value in all intermediate nodes be overridden.
9(1).18	RECBUF1	System	42	Number of receive buffers for LAN channel 1
9(2).10	NET2	System	0	Network number for channel 2. This value is normally taken from a configuration file in the UNIX environment.
9(2).11	NODE1	System	0	Node number for channel 2. This value is normally taken from a configuration file in the UNIX environment.

Table 2-9. Properties for the Data Base Element NETWL1 (Continued)

Terminal no.	Terminal name	Value entered by	Default value	Description
9(2).12	PROT2	System/ User	MB 300	Protocol type for this channel. The following protocols are available: MB 300 (value=1) Standard MB 300 MB 300_F(value=2) MB 300 using fixed packet size (old version) MB 300_E (value=3) MB 300 Extended
9(2).13	PARAM2	System	0	Not used
9(2).14	CYCLET2	System/ User	10	Routing transmit cycle time. With this property, the generation of routing messages sent on the network can be controlled. Default value 10 generates one message per second. Range 10...127.
9(2).15	DIST2	System	51	Distance table size. A table of distances to every neighbor node.
9(2).16	FILTER2	System	0	With this property, the maximum distance can be reduced. Distance (1..7) is defined as “1+2(number of intermediate nodes)” between two communicating nodes. The default value for FILTER1= 0, i.e., no reduction of the maximum distance. If distance is reduced in an intermediate node, then the maximum distance is automatically reduced in all end nodes (with OVERRIDE1=0, see below) which communicate via the intermediate node. Allowed values (1...7). **This property is not valid for MB 300E.**

Table 2-9. Properties for the Data Base Element NETWL1 (Continued)

Terminal no.	Terminal name	Value entered by	Default value	Description
9(2).17	OVERRID1	System	0	With this property, it is possible for a communicating end node to specify that the FILTER2 value in all intermediate nodes be overridden.
9(2).18	RECBUF2	System	42	Number of receive buffers for LAN channel 2

TL Data Base Element

The transport layer is based upon ISO transport protocol class 4 and includes segmentation and re-assembly of user data, flow control in combination with pipelining, and error detection and recovery. The transport layer data base values can be modified. The data base index for this concept is 188,9 on PU510.

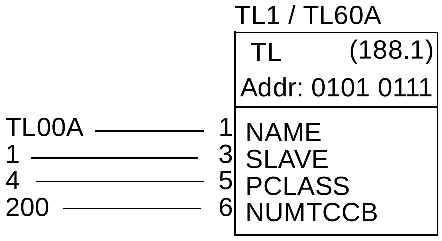


Figure 2-38. TL Data Base Element

Head:

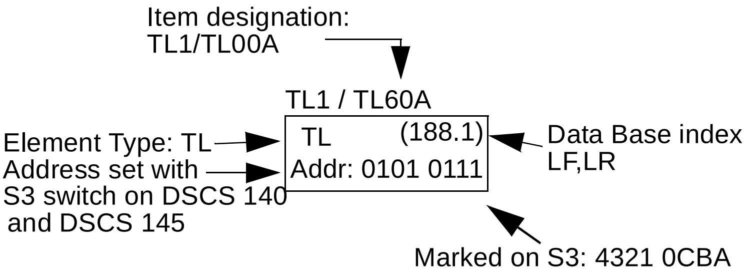


Figure 2-39. Head of NL Data Base Element

TU Data Base Element

The transport user element assigns transport connections initial values. The data base index for this concept is 189,9 on PU510.

For further information, see Section 2.2.9.6, TU Data Base Element.

BM Data Base Element

MasterNet buffer manager administrates sharing data storage in the communication buffer pool. The basic element of data storage is a buffer list, which consists of one or more buffer descriptors. The buffer itself can contain up to eight chained blocks of physical memory of a specified class and priority. The buffer manager Data Base Element can only be read. The data base index for this concept is 190,9 on PU510.

For further information, see Section 2.2.9.7, BM Data Base Element.

NM Data Base Element

Use the network management element to define the size of the network management resources. The network management Data Base Element can only be read. The data base index for this concept is 191,9 on PU510.

For further information, see Section 2.2.9.8, NM Data Base Element.

2.2.8.2 Advant Controller 410

LAN Data Base Element

The values strapped on the CS513 communication module are transferred by the system and are reflected in the Data Base Element for CS513 LAN1/LAN2. Errors are reported as values on the ERRTYPE terminal, see Figure 2-40.

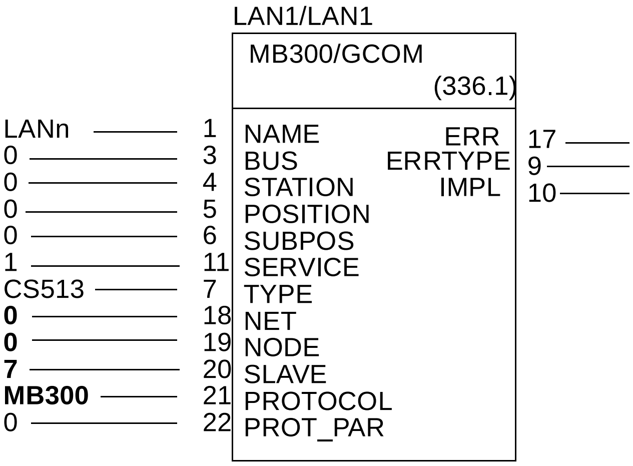


Figure 2-40. CS513 Data Base Element (LAN)

Table 2-10. Properties for the LAN Data Base Element

Terminal no.	Terminal name	Value entered by	Default value	Description
1	NAME	System	LANn(1)	Unique name of Data Base Element
3	BUS	Not Applicable	0	Not implemented
4	STATION	Not Applicable	0	Not implemented
5	POSITION	System	0	In Advant Controller 410, always 0
6	SUBPOSITION	System	1 or 2	LAN channel number
7	TYPE	System	CS513	HW type of LAN module
9	ERRTYPE	System	00	Error type see table 00 = no error
10	IMPL	System	-	This flag is set to TRUE when communication is running and set to FALSE when communication is stopped.
11	SERVICE	System/ User	-	This property is set to 1 when the communication is started. When it is set to 0 by the user, the communication stops.
17	ERR	System	0	Error flag which is set when an error is detected.
18	NET	User	-	Network number
19	NODE	User	-	Node number
20	SLAVE	System	0	Only slave numbers 7 and 8 are accepted in Advant Controller 410

Table 2-10. Properties for the LAN Data Base Element (Continued)

Terminal no.	Terminal name	Value entered by	Default value	Description
21	PROTOCOL	User	MB 300 (01 = MB 300 02 = MB 300_F 03 = MB 300_E)	Protocol type, can be of type MB 300 (variable MAC PDU size), MB 300_F (fixed MAC PDU) or MB 300E
22	PROT_PAR	User	0	Not applicable in Advant Controller 410

(1) n = 1 or 2

Table 2-11. Error Codes from LANn Data Base Element

Type	Code	Interpretation
ermacaddr	21	Duplicate node number on the network
ernode	22	More than one node number in the station
ercntnet	23	Station connected to more than one Control Network
ernetw	25	Network number already used in Control Network
erbus	31	Module not found or internal bus error
erhwid	32	Incorrect hardware identity on module
erinit	33	Start-up of module failed
erhw	34	Suspected hardware error
erswid	35	Incorrect software identity on module
erifid	36	Incorrect module interface identity
erhbt	39	Heart beat (SQE) error from the LAN transceiver (lost contact with the transceiver)
erslvno	50	Illegal slave number
erpositi	51	Illegal module position
erdubpos	52	Module position number already used in the Advant Controller
erdubslv	53	Two modules have the same slave number
erdubmac	54	Two LAN modules have the same slave number for MB 300/300E in host

Communication Data Base Elements

All MasterBus 300 communication parameters are assigned default values. These values are sufficient in almost all ABB MasterBus 300 installations, so you do not need to give the corresponding Data Base Element values. It is possible, however, to read these values even if, in most cases, they are of little interest.

In a few installations, it may be necessary to tune the network. In order to tune the network, you need Network Management or System & Data Base Command Processors, and a deeper knowledge of the MasterNet characteristics. This service is only available as an expert tool and is not defined in this document.

The Network Layer Data Base Element

Summary

The network layer Data Base Element NETWL1, data base index 187,9, contains parameters to select protocol and parameters for the network dynamic routing scheme. All parameters are defined separately for each of the two LAN channels.

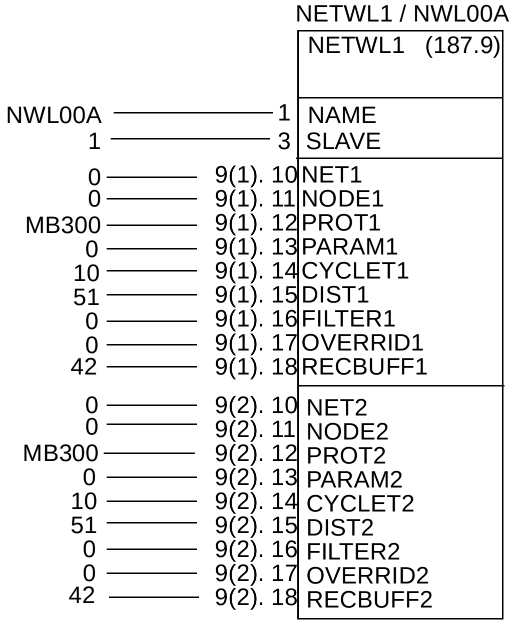


Figure 2-41. Network Layer DB Element

Head:

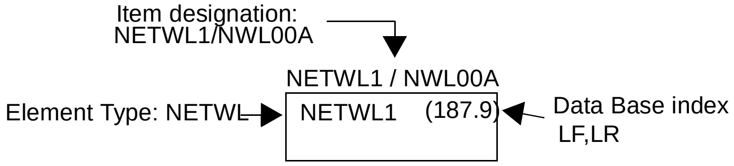


Figure 2-42. Head of Network Layer DB Element

Table 2-12. Properties for the Data Base Element NETWL1

Terminal no.	Terminal name	Value entered by	Default value	Description
1	NAME	System	NETWL1	Unique name of DB
2	SLAVE	System	1	Slave number
9(1).10	NET1	System	0	Network number for channel 1
9(1).11	NODE1	System	0	Node number for channel 1
9(1).12	PROT1	System	MB 300	Protocol type for this channel. The following protocols are available: MB 300 (value=1) Standard MB 300 MB 300_F(value=2) MB 300 using fixed packet size. MB 300_E (value=3) MB 300 Extended.
9(1).13	PARAM1	System	0	Not used
9(1).14	CYCLET1	System/ User	10	Routing transmit cycle time. With this property, the generation of routing messages sent on the network can be controlled. Default value 10 will generate one message per second. Range 10...127.
9(1).15	DIST1	System	51	Distance table size. A table of distances to every neighbor node.

Table 2-12. Properties for the Data Base Element NETWL1 (Continued)

Terminal no.	Terminal name	Value entered by	Default value	Description
9(1).16	FILTER1	System	0	With this property, the maximum distance can be reduced. Distance (1..7) is defined as "1+2*(number of intermediate nodes)" between two communicating nodes. The default value for FILTER1= 0, i.e., no reduction of the maximum distance. If distance is reduced in an intermediate node, then the maximum distance is automatically reduced in all end nodes (with OVERRIDE1=0, see below) which communicate via the intermediate node. Allowed values (1...7). **This property is not valid for MB 300E.**
9(1).17	OVERRID 1	System	0	With this property, it is possible for a communicating end node to specify that the FILTER1 value in all intermediate nodes be overridden.
9(1).18	RECBUF1	System	42	Number of receive buffers for LAN channel 1
9(2).10	NET2	System	0	Network number for channel 2.
9(2).11	NODE2	System	0	Node number for channel 2.
9(2).12	PROT2	System/ User	MB 300	Protocol type for this channel. The following protocols are available: MB 300 (value=1) Standard MB 300 MB 300_F(value=2) MB 300 using fixed packet size (old version) MB 300_E (value=3) MB 300 Extended
9(2).13	PARAM2	System	0	Not used
9(2).14	CYCLET2	System/ User	10	Routing transmit cycle time. With this property, the generation of routing messages sent on the network can be controlled. Default value 10 generates one message per second. Range 10...127.

Table 2-12. Properties for the Data Base Element NETWL1 (Continued)

Terminal no.	Terminal name	Value entered by	Default value	Description
9(2).15	DIST2	System	51	Distance table size. A table of distances to every neighbor node.
9(2).16	FILTER2	System	0	With this property, the maximum distance can be reduced. Distance (1..7) is defined as "1+2(number of intermediate nodes)" between two communicating nodes. The default value for FILTER1= 0, i.e., no reduction of the maximum distance. If distance is reduced in an intermediate node, then the maximum distance is automatically reduced in all end nodes (with OVERRIDE1=0, see below) which communicate via the intermediate node. Allowed values (1...7). **This property is not valid for MB 300E.**
9(2).17	OVERRID 2	System	0	With this property, it is possible for a communicating end node to specify that the FILTER2 value in all intermediate nodes be overridden.
9(2).18	RECBUF2	System	42	Number of receive buffers for LAN channel 2.

TL Data Base Element

The transport layer is based upon ISO transport protocol class 4 and includes segmentation and re-assembly of user data, flow control in combination with pipelining, and error detection and recovery. You can modify the transport layer data base values. The data base index for this concept is 188,9 in AC 410.

For further information, see Section 2.2.9.5, TL Data Base Element.

TU Data Base Element

The transport user element assigns transport connections initial values. The data base index for this concept is 189,9 in AC 410.

For further information, see Section 2.2.9.6, TU Data Base Element.

BM Data Base Element

MasterNet buffer manager administrates sharing data storage in the communication buffer pool. The basic element of data storage is a buffer list, which consists of one or more buffer descriptors. The buffer itself can contain up to eight chained blocks of physical memory of a specified class and priority. The buffer manager Data Base Element can only be read. The data base index for this concept is 190,9 in AC 410.

For further information, see Section 2.2.9.7, BM Data Base Element.

NM Data Base Element

Use the network management element to define the size of the network management resources. The network management Data Base Element can only be read. The data base index for this concept is 191,9 in AC 410.

For further information, see Section 2.2.9.8, NM Data Base Element.

2.2.8.3 Advant Controller 450

You can use a number of combinations of carrier boards and protocols in Advant Controller 450. MasterBus 300, MasterBus 300E, and GCOM are to be considered as different protocol types. The basic rule to follow is:

You can not run **the same protocol type** using slave number 1-6 together with slave number 7 or 8 simultaneously!

It is however possible to have one protocol type with slave number 1-6 and another protocol type using slave number 7-8.

The only exception from this rule is GCOM, which can use slave number 1-6 only.

Table 2-13. Board Type and Protocols Using CS513

Carrier Board Type	Submodule slot	The other submodule slot	Comments
1. SC520 2. SC520 3. SC520 4. SC520	MasterBus 300 MasterBus 300 MasterBus 300 MasterBus 300	MasterBus 300E MasterBus 300E Other module type Other module type	MasterBus 300 can use slave nos. 1 - 6. MasterBus 300E can use slave nos. 7 and 8.
1. SC520 2. SC520 3. SC520 4. SC520	MasterBus 300E MasterBus 300E MasterBus 300E MasterBus 300E	MasterBus 300 MasterBus 300 Other module type Other module type	MasterBus 300E can use slave nos. 1 - 6. MasterBus 300 can use slave nos. 7 and 8.
1. SC520 2. SC520	MasterBus 300 MasterBus 300	MasterBus 300 MasterBus 300	MasterBus 300 can use slave nos. 1 - 6.

Table 2-13. Board Type and Protocols Using CS513 (Continued)

Carrier Board Type	Submodule slot	The other submodule slot	Comments
1. SC520 2. SC520	MasterBus 300E MasterBus 300E	MasterBus 300E MasterBus 300E	MasterBus 300E can use slave nos. 1 - 6.
1. SC520 2. SC520	MasterBus 300 MasterBus 300	MasterBus 300E MasterBus 300E	MasterBus 300 can use slave nos. 1 - 6 or 7 and 8. MasterBus 300E can use slave nos. 1 - 6 or 7 and 8.
1. SC520 2. SC510	MasterBus 300 MasterBus 300E	MasterBus 300 MasterBus 300E	MasterBus 300 can use slave nos. 1 - 6. MasterBus 300E can use slave nos. 7 and 8.
1. SC520 2. SC510 3. SC510	MasterBus 300E MasterBus 300 MasterBus 300	MasterBus 300E Other module type Other module type	MasterBus 300E can use slave nos. 1 - 6. MasterBus 300 can use slave nos. 7 and 8.
1. SC510 2. SC510	MasterBus 300 MasterBus 300E	Other module type Other module type	MasterBus 300/300E can use slave nos. 7 and 8.
1. SC510 2. SC510	MasterBus 300E MasterBus 300E	Other module type Other module type	MasterBus 300E can use slave nos. 7 and 8.
1. SC530 2. SC530	GCOM GCOM	MasterBus 300 MasterBus 300E Or other module types	GCOM can use slave nos. 1- 6. MasterBus 300/300E can use slave nos. 7 and 8.

LAN Data Base Element

The values strapped on the CS513 communication module are transferred by the system and are reflected in the Data Base Element for CS513 LANx. Errors are reported as values on the ERRTYPE terminal. The terminal PROT_PAR is only used when the PROTOCOL = GCOM (GCOM standard). PROT_PAR is used to tune the time-out times when GCOM is used for communication via bridges, which introduces delays and limits the bandwidth.

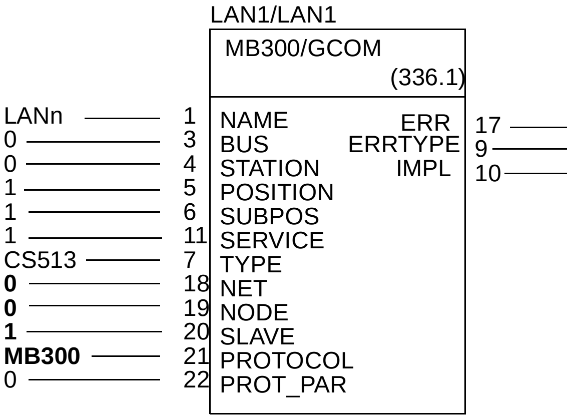


Figure 2-43. CS513 Data Base Element (LAN)

Table 2-14. Properties for the LAN Data Base Element

Terminal no.	Terminal name	Value entered by	Default value	Description
1	NAME	System	LANn (n = 1 or 2)	Unique name of Data Base Element
3	BUS	Not Applicable	0	Not implemented
4	STATION	Not Applicable	0	Not implemented
5	POSITION	System	0	Carrier board position
6	SUBPOSITION	System	1 or 2	Module position on carrier board
7	TYPE	System	CS513	HW type of LAN module
9	ERRTYPE	System	00	Error type see table 00 = no error
10	IMPL	System	-	This flag is set to TRUE when communication is running and set to FALSE when communication is stopped.

Table 2-14. Properties for the LAN Data Base Element (Continued)

Terminal no.	Terminal name	Value entered by	Default value	Description
11	SERVICE	System/ User	-	This property is set to 1 when the communication is started. When it is set to 0 by the user, the communication stops.
17	ERR	System	0	Error flag which is set when an error is detected.
18	NET	User	-	Network number
19	NODE	User	-	Node number
20	SLAVE	System	0	Only slave numbers 7 and 8 are accepted in Advant Controller 410.
21	PROTOCOL	User	MB 300 (01 = MB 300 02 = MB 300_F 03 = MB 300_E)	Protocol type, can be of type MB 300 (variable MAC PDU size), MB 300_F (fixed MAC PDU) or MB 300E
22	PROT_PAR	User	0	Only used when the PROTOCOL = GCOM (PROT_PAR is used to tune the time-out times when GCOM is used for communication via bridges, which introduces delays and limits the bandwidth.) See description below.

PROT_PAR = 0:
Acknowledge time-out for a message = 250 ms
Transit vector traffic every 1 s
Used for normal GCOM links without bridges.

PROT_PAR = 1 to 15:
Acknowledge time-out for a message = 500 ms * PROT_PAR
Transit vector traffic every 1 s * PROT_PAR

Table 2-15. Error Codes from LAN Data Base Element

Type	Code	Interpretation
ermacaddr	21	Duplicate node number on the network
ernode	22	More than one node number in the station
ercntnet	23	Station connected to more than one Control Network
ernetw	25	Network number already used in Control Network
erbus	31	Module not found or internal bus error
erhwid	32	Incorrect hardware identity on module
erinit	33	Start-up of module failed
erhw	34	Suspected hardware error
erswid	35	Incorrect software identity on module
erifid	36	Incorrect module interface identity
erhbt	39	Heart beat (SQE) error from the LAN transceiver (lost contact with the transceiver)
erslvno	50	Illegal slave number
erpositi	51	Illegal module position
erdubpos	52	Module position number already used in the Advant Controller
erdubslv	53	Two modules have the same slave number
erdubmac	54	Two LAN modules have the same slave number for MB 300/300E in host

Table 2-16. CS513 and Data Base Elements

Data Base Element	Slave Number	Network Layer Data Base Element	CS513 Module Position on carrier board	Protocol and Board Type
LAN1	7	NEWL9 data base index 187,9, channel 1	1 or 2	MB 300 or MB 300E on SC 510, SC 520 or SC 530
LAN2	8	NEWL9 data base index 187,9, channel 2	1 or 2	MB 300 or MB 300E on SC 510, SC 520 or SC 530

Table 2-16. CS513 and Data Base Elements (Continued)

Data Base Element	**Slave Number**	**Network Layer Data Base Element**	**CS513 Module Position on carrier board**	**Protocol and Board Type**
LAN 3				Not used
LAN4				Not used
LAN5				Not used
LAN6				Not used
LAN7	1	NEWL1 data base index 187,1, channel 1	1	MB 300, MB 300E on SC 520 or GCOM on SC 530
LAN8	1	NEWL1 data base index 187,1, channel 2	2	MB 300, MB 300E on SC 520 or GCOM on SC 530
LAN9	2	NEWL2 data base index 187,2, channel 1	1	MB 300, MB 300E on SC 520 or GCOM on SC 530
LAN10	2	NEWL2 data base index 187,2, channel 2	2	MB 300, MB 300E on SC 520 or GCOM on SC 530
LAN11	3	NEWL3 data base index 187,3, channel 1	1	MB 300, MB 300E on SC 520 or GCOM on SC 530
LAN12	3	NEWL3 data base index 187,3, channel 2	2	MB 300, MB 300E on SC 520 or GCOM on SC 530
LAN13	4	NEWL4 data base index 187,4, channel 1	1	MB 300, MB 300E on SC 520 or GCOM on SC 530
LAN14	4	NEWL4 data base index 187,4, channel 2	2	MB 300, MB 300E on SC 520 or GCOM on SC 530
LAN15	5	NEWL5 data base index 187,5, channel 1	1	MB 300, MB 300E on SC 520 or GCOM on SC 530
LAN16	5	NEWL5 data base index 187,5, channel 2	2	MB 300, MB 300E on SC 520 or GCOM on SC 530

Table 2-16. CS513 and Data Base Elements (Continued)

Data Base Element	Slave Number	Network Layer Data Base Element	CS513 Module Position on carrier board	Protocol and Board Type
LAN17	6	NEWL6 data base index 187,6, channel 1	1	MB 300, MB 300E on SC 520 or GCOM on SC 530
LAN18	6	NEWL6 data base index 187,6, channel 1	2	MB 300, MB 300E on SC 520 or GCOM on SC 530

Communication Data Base Elements

All MasterBus 300 communication parameters are assigned default values. These values are sufficient in almost all ABB MasterBus 300 installations, so you do not need to give the corresponding Data Base Element values. It is possible, however, to read these values even if, in most cases, they are of little interest.

In a few installations, it may be necessary to tune the network. In order to tune the network, you need Network Management or System & Data Base Command Processors, and a deeper knowledge of the MasterNet characteristics. This service is only available as an expert tool and is not defined in this document.

NETWL Data Base Element

The network layer includes a dynamic routing scheme, suitable for different types of network topology. The algorithm supports alternative paths and automatically adapts to topology changes. The network layer data base values can only be read. The data base indexes for this concept are 187,1 - 187,6 and 187,9 in AC 450. For further information, see Section 2.2.8.2, Advant Controller 410, Figure 2-41 and Table 2-12.

TL Data Base Element

The transport layer is based upon ISO transport protocol class 4 and includes segmentation and re-assembly of user data, flow control in combination with pipelining and error detection and recovery. The transport layer data base values can be modified. The data base indexes for this concept are 188,1 - 188,6 and 188,9 in AC 450. For further information, see Section 2.2.9.5, TL Data Base Element.

TU Data Base Element

The transport user element assigns transport connections initial values. The data base indexes for this concept are 189,1 - 189,6 and 189,9 in AC 450. For further information, see Section 2.2.9.6, TU Data Base Element.

BM Data Base Element

MasterNet buffer manager administrates sharing data storage in the communication buffer pool. The basic element of data storage is a buffer list, which consists of one or more buffer descriptors.

The buffer itself can contain up to eight chained blocks of physical memory of a specified class and priority. The buffer manager Data Base Element can only be read. The data base indexes for this concept are 190,1 - 190,6 and 190,9 in AC 450. For further information, see Section 2.2.9.7, BM Data Base Element.

NM Data Base Element

The network management element is used to define the size of the network management resources. The network management Data Base Element can only be read. The data base indexes for this concept are 191,1 - 191,6 and 191,9 in AC 450. For further information, see Section 2.2.9.8, NM Data Base Element.

2.2.9 Communication Parameters for MP 200/1, MV 800/1 and MG 230/1

2.2.9.1 MB 300 in MP 200/1, MV 800/1 and MG 230/1

All MasterBus 300 communication parameters are assigned default values. These values are sufficient in almost all ABB MasterBus 300 installations, so you do not need to give the corresponding Data Base Element values. It is possible, however, to read these values even if, in most cases, they are of little interest.

In a few installations, it may be necessary to tune the network. In order to tune the network, you need Network Management or System & Data Base Command Processors, and a deeper knowledge of the MasterNet characteristics. This service is only available as an expert tool and is not defined in this document.

2.2.9.2 MB 300 E in MP 200/1, MV 800/1 and MG 230/1

MasterBus 300 Extended is used to communicate over datalink-layer bridges conforming to IEEE 802.3 on one side of the bridge and another (slower) communication interface on the other side. The difference between MasterBus 300 and 300E is that you can tune the communication parameters for the MasterBus 300E´s communication stack.

MasterBus 300 is optimized for running at 10 Mbps transmission speed. The purpose of tuning communication parameters in the MasterBus 300E is to reduce the bandwidth used for "network administration messages" such as network routing messages and cyclic acknowledge on the transport layer.

The communication parameters that will affect the "basic network load" are stored in the data base, in the Data Base Elements Network Layer (NL1...NL16) and in the Transport User (TU1...TU16). It is also possible for you to tune the number of outstanding unacknowledged transport layer protocol data units (TPDU), which is useful when the actual transmission time is "long" (round trip delay, for example, if you are communicating via satellite).

NOTE

To change the values with the command ModifyDataBase (MDB), you need Master Aid SW (release 91 version). If you do not have the '91 release of MasterAid SW, you must use the Database Editor and the commands Find-INStance (FINS), GetINStance (GINS), ModifyINStance (MINS) and ModifyPROperty (MPRO) together with LogicalFile (LF) and LogicalRecord (LR).

You will find the LF and LR values in the description of the elements. The Data Base Editor commands can be found on the System & Data Base command processor.

2.2.9.3 GCOM IEEE 802.3 in MP 200/1 and MG 230/1

Please refer to the *MasterGate 230/1 Installation and Error Codes*.

2.2.9.4 Network Layer (NL)

The network layer includes a dynamic routing scheme, suitable for different types of network topology. The algorithm supports alternative paths and automatically adapts to topology changes. The network layer data base values can only be read.

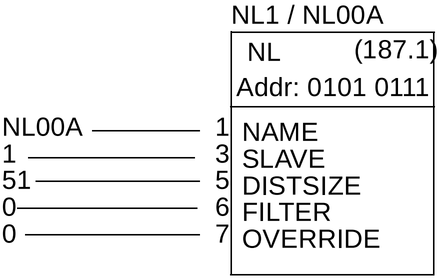


Figure 2-44. NL Data Base Element

Head:

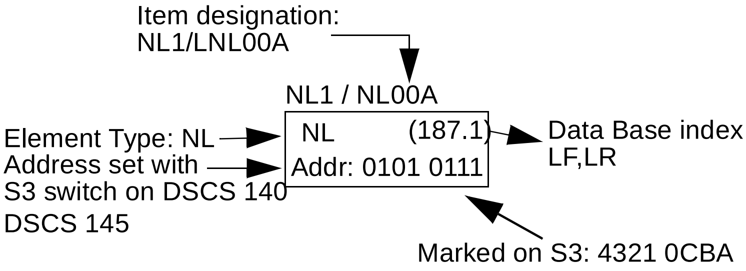


Figure 2-45. Head of NL Data Base Element

Predefined DSCS 140/145 strap address:

Each DSCS 140/145 communication board relates to a Data Base Element via its strap address.

Table 2-17. Predefined DSCS 140/145 Addresses

Data Base Index LF, LR	Item Designation	Name	S3 strapping	Slave
187,1	NL1	NL00A	0101 0111	1
187,2	NL2	NL00AB	0101 1111	2
187,3	NL3	NL00C	0110 0111	3
187,4	NL4	NL00D	0110 1111	4
187,5	NL5	NL00E	0111 0111	5
187,6	NL6	NL00F	0111 1111	6
187,7	NL7	NL00G	1000 0111	7
187,8	NL8	NL00H	1000 1111	8
187,9	NL9	NL00I	1001 0111	9
187,10	NL10	NL00J	1001 1111	10
187,11	NL11	NL00K	1010 0111	11
187,12	NL12	NL00L	1010 1111	12
187,13	NL13	NL00M	1011 0111	13
187,14	NL14	NL00N	1011 1111	14
187,15	NL15	NL00O	1100 0111	15
187,16	NL16	NL00P	1100 1111	16

Properties:

Table 2-18. Properties of NL Element

Terminal No.	Terminal Name	Value entered by:	Default Value	Description
1	NAME	System		Name of the network layer Data Base Element. Should be one of these: NL00A, NL00B...NL00P.
3	SLAVE	System		This property indicates the slave processor on which the update task is resident.

Table 2-18. Properties of NL Element (Continued)

Terminal No.	**Terminal Name**	**Value entered by:**	**Default Value**	**Description**
5	DIST-SIZE	System	51	Distance Table Size. This table consists of an entry for each neighbor node and additionally one entry for each host and slave processor within the node. A neighbor node is a node in the network to which at least one direct physical connection is established. Each entry consists of the distance to MB 300 nodes.
6	FILTER	System	0	With this property, the maximum communication distance can be reduced. Distance (1...7) is defined as 1 + 2 * number of intermediated nodes between two communicating nodes. The default value for FILTER = 0, i.e., no reduction of the maximum distance. If distance is reduced in an intermediate node, then the maximum distance is automatically reduced in all end nodes (with OVERRIDE = 0, see below), which communicates via the intermediate node. 0 ≤ FILTER ≤ 6. **This property is not valid for MasterBus 300E, DSCS 145.**
7	OVER-RIDE	System System / User	0	**MB 300:** With this property, it is possible for a communicating end node to override FILTER (see above) in all intermediate nodes. Default value = 0, i.e., no override. **MB 300E:** This property is used for other purposes for MasterBus 300E, DSCS 145. The periodicity of sending routing messages can be specified here. The value 10...127 can be specified, which corresponds to 1.0 - 12.7 seconds between the routing messages. Default value = 0, with one-second periodicity.

You can use the property 7 OVERRIDE to specify how often routing messages are transmitted. The default value is 0 and gives one routing message per second. The valid figures are 10...127, which give the cycle, when a routing message is sent, of 1..12,7 seconds.

NOTE

When you increase the time between sending routing messages, there is a corresponding increase in the time allotted to detect when the contact is lost to any communicating node.

2.2.9.5 TL Data Base Element

Summary:

The transport layer is based upon ISO transport protocol class 4 and includes segmentation and re-assembly of user data, flow control in combination with pipelining, and error detection and recovery. You can modify the transport layer data base values.

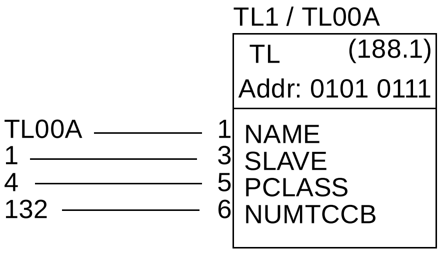


Figure 2-46. TL Data Base Element

Head:

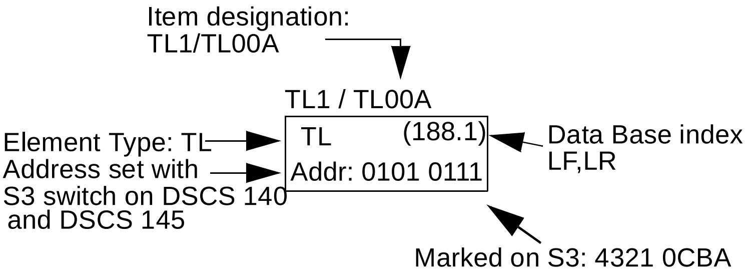


Figure 2-47. Head of NL Data Base Element

Predefined DSCS 140/145 strap address:

Each DSCS 140/145 communication board is connected to a Data Base Element via its strap address.

Table 2-19. Predefined DSCS 140/145 Addresses

Data Base Index LF, LR	**Item Designation**	**Name**	**S3 strapping** (DSCS 140 and DSCS 145 only)	**Slave**
188,1	TL1	TL00A	0101 0111	1
188,2	TL2	TL00B	0101 1111	2
188,3	TL3	TL00C	0110 0111	3
188,4	TL4	TL00D	0110 1111	4
188,5	TL5	TL00E	0111 0111	5
188,6	TL6	TL00F	0111 1111	6
188,7	TL7	TL00G	1000 0111	7
188,8	TL8	TL00H	1000 1111	8
188,9	TL9	TL00I	1001 0111	9
188,10	TL10	TL00J	1001 1111	10
188,11	TL11	TL00K	1010 0111	11
188,12	TL12	TL00L	1010 1111	12
188,13	TL13	TL00M	1011 0111	13
188,14	TL14	TL00N	1011 1111	14
188,15	TL15	TL00O	1100 0111	15
188,16	TL16	TL00P	1100 1111	16

Properties:

Table 2-20. Properties of TL Element

Terminal No.	**Terminal Name**	**Value entered by:**	**Default Value**	**Description**
1	NAME	System		Name of the Transport Layer Data Base Element. Should be one of these: TL00A, TL00B...TL00P.
3	SLAVE	System		This property indicates the slave processor on which the transport protocol is resident.

Table 2-20. Properties of TL Element (Continued)

Terminal No.	Terminal Name	Value entered by:	Default Value	Description
5	PCLASS	System	4	Transport protocol class
6	NUM-TCCB	System	132	Number of transport connection control blocks

2.2.9.6 TU Data Base Element

Summary:

The transport user element assigns transport connections initial values.

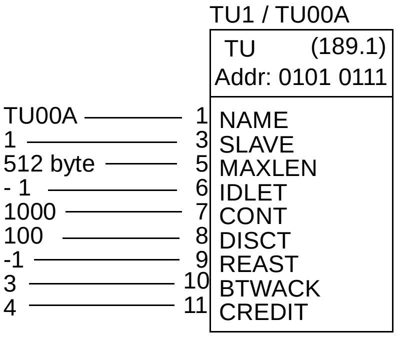


Figure 2-48. TU Data Base Element

Head:

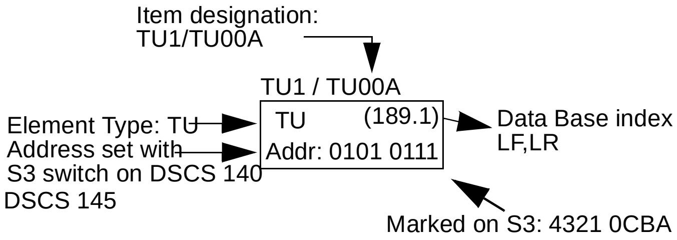


Figure 2-49. Head of TU Data Base Element

Predefined DSCS 140/145 strap address:

Each DSCS 140/145 communication board is referred to a Data Base Element via its strap address.

Each CS513 communication module is referred to a Data Base Element via its slave number set on the dip switch S1.

Table 2-21. Predefined DSCS 140/145 Addresses

Data Base Index LF, LR	**Item Designation**	**Name**	**S3 strapping** (DSCS 140 and DSCS 145 only)	**Slave**
189,1	TU1	TU00A	0101 0111	1
189,2	TU2	TU00B	0101 1111	2
189,3	TU3	TU00C	0110 0111	3
189,4	TU4	TU00D	0110 1111	4
189,5	TU5	TU00E	0111 0111	5
189,6	TU6	TU00F	0111 1111	6
189,7	TU7	TU00G	1000 0111	7
189,8	TU8	TU00H	1000 1111	8
189,9	TU9	TU00I	1001 0111	9
189,10	TU10	TU00J	1001 1111	10
189,11	TU11	TU00K	1010 0111	11
189,12	TU12	TU00L	1010 1111	12
189,13	TU13	TU00M	1011 0111	13
189,14	TU14	TU00N	1011 1111	14
189,15	TU15	TU00O	1100 0111	15
189,16	TU16	TU00P	1100 1111	16

Properties:

Table 2-22. Properties of TU Data Base Element

Terminal No.	**Terminal Name**	**Value entered by:**	**Default Value**	**Description**
1	NAME	System		Name of the DSX function. Should be one of these: TU00A, TU00B...TU00P.
3	SLAVE	System		This property indicates the slave processor on which the transceiver is resident.

Table 2-22. Properties of TU Data Base Element (Continued)

Terminal No.	Terminal Name	Value entered by:	Default Value	Description
5	MAX-SLEN	System	512	Maximum signal length expressed in bytes for a transport connection with low or normal priority.
6	IDLET	System System / User	- 1	**MB 300:** Transport idle time. This property specifies the maximum time that a transport connection with low or normal priority is allowed to be unused while in data transfer state. If this timer expires, the transport connection is disconnected and data can be lost. Time is expressed in 10 ms units. - 1 means infinite. **MB 300E:** This is the property in which you can specify how often the cyclic acknowledgment is sent. Can be set to 600... 1200 which corresponds to 6 - 12 seconds. -1 = the default value 6 seconds.
7	CONT	System	1000	Transport connection request time. This property specifies the maximum time allowed for the successful establishment of a transport connection. Time is expressed in 10 ms units.
8	DISCT	System	1000	Disconnect time. This property specifies the maximum time a transport connection is allowed to be in the disconnecting state. Time is expressed in 10 ms units.
9	REAST	System	- 1	Re-assembly time. This property specifies the maximum time that can elapse before a Transport Service Data Unit (TSDU) is successfully re-assembled on a transport connection with low or normal priority. If this timer expires, the transport connection is disconnected and data can be lost. Time is expressed in 10 ms units. -1 means infinite.

Table 2-22. Properties of TU Data Base Element (Continued)

Terminal No.	Terminal Name	Value entered by:	Default Value	Description
10	BTW-ACK	System / User	3	Between acknowledgment. This property specifies for transport connections with low or normal priority when it is time for the receiving transport entity to transmit an acknowledgment with the new credit to allow the sending transport entity to continue to send. BTWACK is expressed in number of received Transport Protocol Data Units (TPDUs). Can be set to 1... 15.
11	CREDIT	System / User	4	Credit. This property specifies the initial maximum number of TPDUs that the receiving transport entity allows the sending transport entity to transmit on a connection with low or normal priority. -1 indicates calculated by the system to allow pipelining. Transport connection send and receive queue size are equal to max (credit, max tsdu). Can be set to 1 ... 15.

You can change the properties 6 IDLET, 10 BTWACK and 11 CREDIT in the TU database element, which influences the basic network load as well as the communication efficiency. The values must be equal in the communicating pier nodes.

You can use the property 6 IDLET to modify the cyclic acknowledge for the transport layer. The default value -1 gives a cycle of six seconds. The valid figures when modifying the value are 600...1200, which correspond to 6,0..12,0 seconds.

The properties 10 BTWACK and 11 CREDIT have a correlation between each other and they affect the sending window size, i.e., how many unacknowledged transport layer PDUs you can have between two communication piers. Default values are BTWACK=3 and CREDIT=4. Valid figures for BTWACK and CREDIT are 1...15.

When communicating over communication links with a long transmission time, you can achieve better throughput if you have a big send window, i.e., a higher value on the CREDIT and BTWACK than the default. Suitable values could be BTWACK=10 and CREDIT=14.

2.2.9.7 BM Data Base Element

Summary:

MasterNet buffer manager administrates sharing data storage in the communication buffer pool. The basic element of data storage is a buffer list, which consists of one or more buffer descriptors. The buffer itself can contain up to eight chained blocks of physical memory of a specified class and priority.

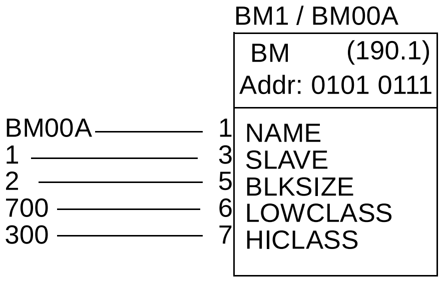


Figure 2-50. BM Data Base Element

Head:

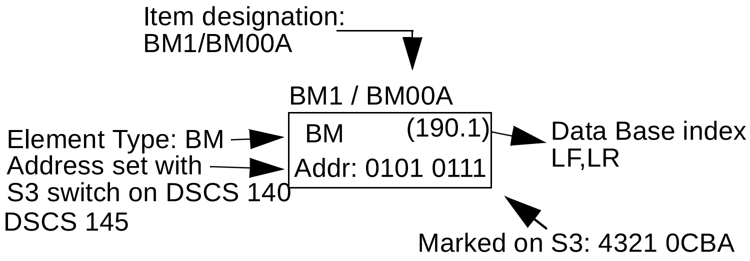


Figure 2-51. Head of BM Data Base Element

Predefined DSCS 140/145 strap address:

Each DSCS 140/145 communication board is connected to a Data Base Element via its strap address.

Each CS513 communication module is referred to a Data Base Element via its slave number set on the dip switch S1.

Table 2-23. Predefined DSCS 140/145 Addresses

Data Base Index LF, LR	**Item Designation**	**Name**	**S3 strapping** (DSCS 140 and DSCS 145 only)	**Slave**
190,1	BM1	BM00A	0101 0111	1
190,2	BM2	BM00B	0101 1111	2
190,3	BM3	BM00C	0110 0111	3
190,4	BM4	BM00D	0110 1111	4
190,5	BM5	BM00E	0111 0111	5
190,6	BM6	BM00F	0111 1111	6
190,7	BM7	BM00G	1000 0111	7
190,8	BM8	BM00H	1000 1111	8
190,9	BM9	BM00I	1001 0111	9
190,10	BM10	BM00J	1001 1111	10
190,11	BM11	BM00K	1010 0111	11
190,12	BM12	BM00L	1010 1111	12
190,13	BM13	BM00M	1011 0111	13
190,14	BM14	BM00N	1011 1111	14
190,15	BM15	BM00O	1100 0111	15
190,16	BM16	BM00P	1100 1111	16

Properties:

Table 2-24. Properties of BM Element

Terminal No.	**Terminal Name**	**Value entered by:**	**Default Value**	**Description**
1	NAME	System		Name of the buffer manager. Should be one of these: BM00A, BM00B...BM00P.
3	SLAVE	System		This property indicates the slave processor on which the buffer manager is resident.

Table 2-24. Properties of BM Element (Continued)

Terminal No.	Terminal Name	Value entered by:	Default Value	Description
5	BLKSIZE	System	2	This property identifies the block-size within the buffer pool. 1 means 64 byte blocks. 2 means 128 byte blocks. 3 means 256 byte blocks. 4 means 512 byte blocks. MasterBus 300/300E requires > 64 byte block.
6	LOW-CLASS	System	700	This property defines the relative number of blocks within the lowest buffer class within the pool. This class has a class number of zero.
7	HI-CLASS	System	300	This property defines the relative increment of blocks in the highest buffer class in the pool. It also defines the maximum number of receive buffers in the data link receive queue. Number of receive buffers are calculated as HICLASS / 7.

2.2.9.8 NM Data Base Element

Summary:

Use the network management element to define the size of the network management resources. The network management Data Base Element can only be read.

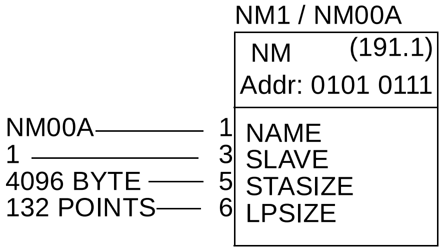


Figure 2-52. NM Data Base Element

Head:

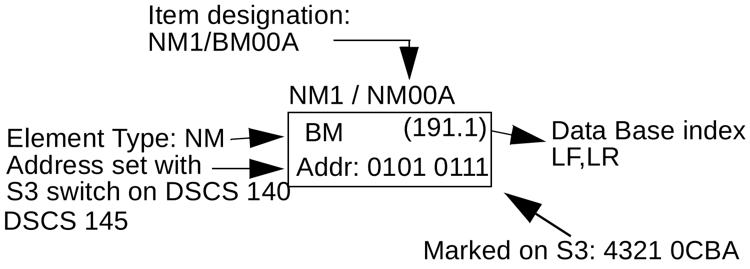


Figure 2-53. Head of NM Data Base Element

Predefined DSCS 140/145 strap address:

Each DSCS 140/145 communication board is connected to a Data Base Element via its strap address.

Each CS513 communication module is referred to a Data Base Element via its slave number set on the dip switch S1.

Table 2-25. Predefined DSCS 140/145 Addresses

Data Base Index LF, LR	**Item Designation**	**Name**	**S3 strapping** (DSCS 140 and DSCS 145 only)	**Slave**
191,1	NM1	NM00A	0101 0111	1
191,2	NM2	NM00B	0101 1111	2
191,3	NM3	NM00C	0110 0111	3
191,4	NM4	NM00D	0110 1111	4
191,5	NM5	NM00E	0111 0111	5
191,6	NM6	NM00F	0111 1111	6
191,7	NM7	NM00G	1000 0111	7
191,8	NM8	NM00H	1000 1111	8
191,9	NM9	NM00I	1001 0111	9
191,10	NM10	NM00J	1001 1111	10
191,11	NM11	NM00K	1010 0111	11
191,12	NM12	NM00L	1010 1111	12
191,13	NM13	NM00M	1011 0111	13
191,14	NM14	NM00N	1011 1111	14
191,15	NM15	NM00O	1100 0111	15

Table 2-25. Predefined DSCS 140/145 Addresses (Continued)

Data Base Index LF, LR	**Item Designation**	**Name**	**S3 strapping** (DSCS 140 and DSCS 145 only)	**Slave**
191,16	NM16	NM00P	1100 1111	16
191,17	NM17	NM00Q	-	HOST

Properties:

Table 2-26. Properties of TL Element

Terminal No.	**Terminal Name**	**Value entered by:**	**Default Value**	**Description**
1	NAME	System		Name of the Transport Layer database element. Should be one of these: NM00A, NM00B...NM00P.
3	SLAVE	System		This property indicates the slave processor on which the Network Management (NM) system is resident. If slave address = 0, then the NM system is resident in the host processor.
5	STASIZE	System	4096	This property determines the size (expressed in bytes) of the statistical log buffer that must be present in the NM system.
6	LPSIZE	System	125	Logpoint size. This property determines the size of the logpoint logbuffer. LPSIZE is expressed in number of logpoints. Each logpoint requires 8 bytes in the buffer.

2.3 Shutdown Procedures

2.3.1 MasterPiece 200/1, MasterView 800/1 and MasterGate 230/1

Set the Start Mode Switch on the DSCS 140/145/150 in OFFLINE position (3) and press the **INIT** button to stop this communication.

2.3.2 Advant Controller 400 Series

You can stop the communication by setting the terminal "SERVICE" in the Data Base element LANn (see Section 2.2.5.2, LAN Data Base Element.). Take the following steps:

1. Set the LANn Data Base element property SERVICE to zero.
2. Disconnect the AUI cable from the CS513.
3. Remove the CS513 from the Submodule Carrier board.

Disconnecting the AUI cable from CS513 or the transceiver also prevents the node from communicating.

2.4 Start-up Procedures

2.4.1 MasterPiece 200/1, MasterView 800/1 and MasterGate 230/1

You can start communication in four different ways:

1. Leave the configuration mode
2. Activate the INIT switch on the host processor front panel
3. Activate the INIT switch on the DSCS 140/145/150 front panel
4. Remote initiate via Network Management

If you leave the configuration mode with the MasterAid 200 command DICONFIG, activate the INIT switch on the host processor or remote initiate via Network Management, the ABB Master system, including all its communication, is restarted.

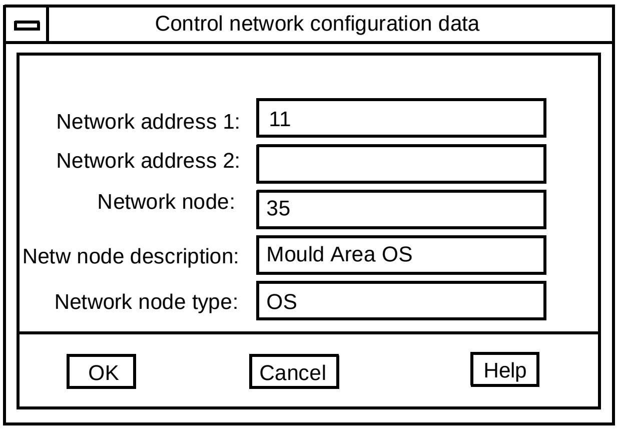
If you activate the INIT switch on the DSCS 140/145/150 front panel or activate the communication via Network Management, the communication package for the particular DSCS 140/145/150 board is restarted.

When communication restarts, a cold start-up is performed, i.e., connections are reestablished. Communication restarts within approximately 15 seconds.

2.4.2 Advant Station 500 series Operator Station

During the start-up, some dialog boxes are presented. All of the boxes, except the parameter-setting box for the Control Network, have default selections which are automatically performed after about five seconds.

If you want to make another selection, click on the selected item and then click on the **OK** button to continue the start-up procedure.


Control network configuration data

Network address 1: 11
Network address 2:
Network node: 35
Netw node description: Mould Area OS
Network node type: OS

Figure 2-54. Dialog Box for Parameter Setting for the Network

Network address 1

Enter the Control Network number or the Plant Network number for the Operator Station.

Network address 2

If the Operator Station is connected to a redundant network, enter the number here.

Network node

Each station must have a unique node number within the Control Network.

Netw node description

The node description you enter here is used by the System Status Function. The node description is shown in the System Status Overview display. The description text can be a maximum of 20 characters.

Network node type

Can be of type OS, IMS or ES.

2.4.3 Advant Controller 400 Series

You can start communication in four different ways:

1. Insert a correctly strapped CS513 module in Advant Controller 410, SC510 or SC520.
2. Leave the configuration mode.
3. Activate the INIT switch on the host processor front panel.
4. Give the ECONFIG or RECONFIG command.

If you leave the configuration mode, enter the Advant Station 100 ES series command DICONFIG or activate the INIT switch on the host processor, the Advant OCS system, including all its communication, is restarted.

NOTE

> The first CS513 you insert baptizes the station with a node number. If an erroneous node number is introduced by mistake, restart the station via the switch on the host processor or give the RECONFIG command before a new node number is accepted.

When communication restarts, a cold start-up is performed, i.e., connections are reestablished. Communication restarts within approximately 20 seconds.

2.5 Product Verification

2.5.1 Advant Controller 410

The values strapped on the CS513 communication module are transferred by the system and are reflected in the Data Base Element for CS513 LANx. Errors are reported as values on the ERRTYPE terminal (see Figure 2-40 and check Table 2-15).

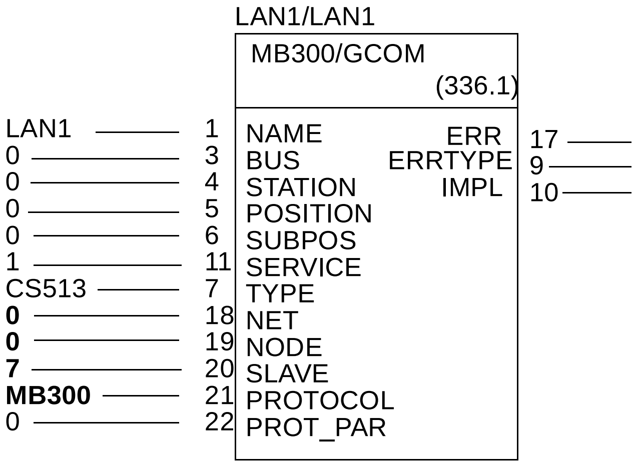


Figure 2-55. CS513 Data Base Element (LAN)

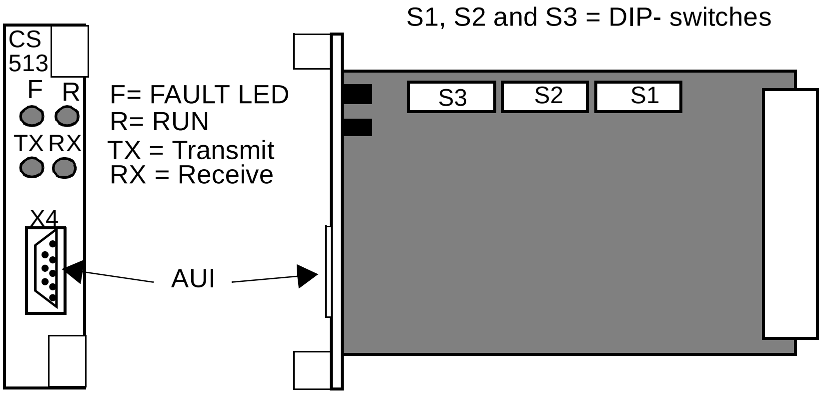


Figure 2-56. CS513 Communication Module

Table 2-27. CS513 LEDs

Name	**Defining**	**LED color**
F	Fault	Red
R	Run	Green
TX/LAN	Transmit to LAN	Yellow
RX	Receive from LAN	Yellow

2.5.2 Advant Controller 450

The values strapped on the CS513 communication module are transferred by the system and are reflected in the Data Base Element for CS513 LANx. Errors are reported as values on the ERRTYPE terminal, see Figure 2-40 and check Table 2-15.

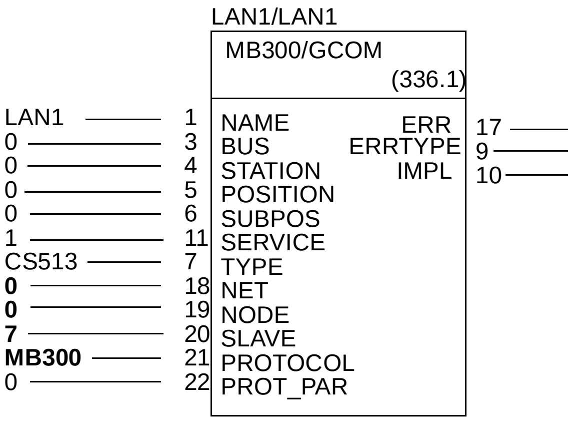


Figure 2-57. CS513 Data Base Element (LAN)

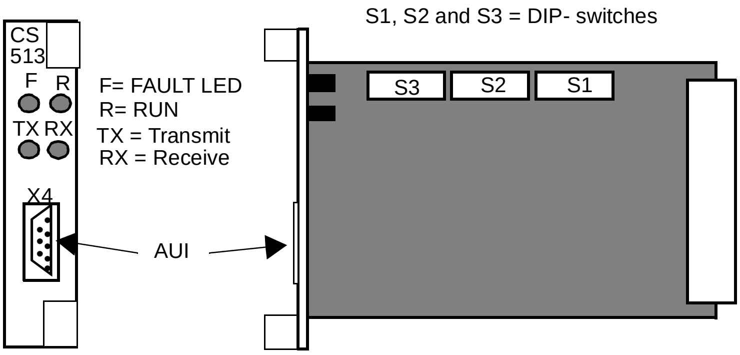


Figure 2-58. CS513

Table 2-28. CS513 LEDs

Name	Defining	LED color
F	Fault	Red
R	Run	Green
TX/LAN	Transmit to LAN	Yellow
RX	Receive from LAN	Yellow

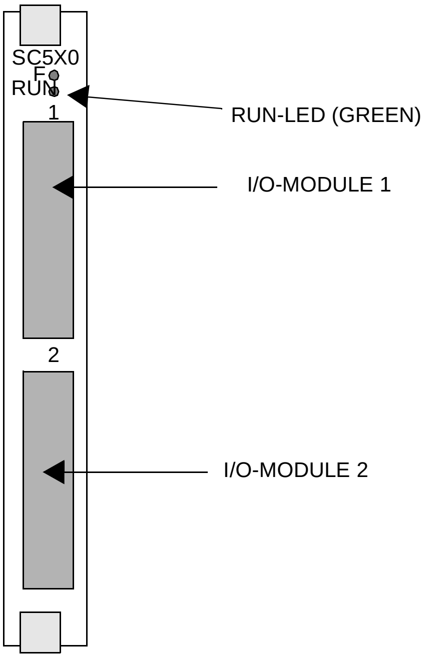


Figure 2-59. SC5X0

Table 2-29. SC5X0 LEDs

Name	Defining	LED color
F	Fault	Red
RUN	Run	Green

2.5.3 MasterPiece 200/1, MasterView 800/1 and MasterGate 230/1

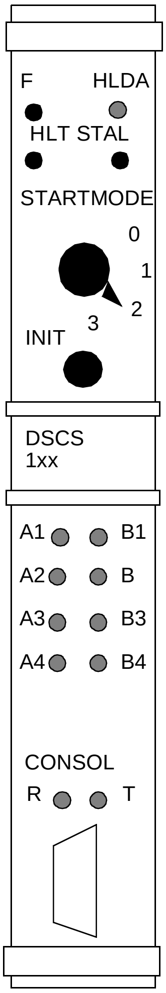


Figure 2-60. Front Panel DSCS 140/145/150

Table 2-30. Front Panel LEDs on DSCS 140/145/150

Name	Defining	LED color
F	Fault	Red
HLDA	DMA access	Yellow
HLT	Halt	Red
STAL	Stall	Red
A1	Receive from network	Yellow
B1	Transmit to network	Yellow
A2 - B2	Not used	-
B2 - B4	Not used	-
R	Receive in OFFLINE mode	Yellow
T	Transmit in OFFLINE mode	Yellow

Chapter 3 Installation GCOM IEEE 802.3

3.1 Site Planning Environment

This chapter is the installation guide for GCOM IEEE 802.3 in the following ABB Advant OCS stations:

- Advant Controller 410
- Advant Controller 450.

The GCOM IEEE 802.3 in MasterPiece 200/1 and MasterGate 230/1 is only briefly described. Please refer to the manual, *MasterGate 230/1 Installation and Error Codes*, for a more detailed description.

3.2 GCOM IEEE 802.3

The characteristics for the GCOM multidrop IEEE 802.3 bus are as follows:

- The multidrop link has an IEEE 802.2 class 1, connectionless unconfirmed data link service and IEEE 802.3 CSMA/CD medium access control. This means that there is no specific master station and that all stations have equal access to the bus. The transmission rate is 10 Mbit/s. The bus can handle up to four (4) computers, see Figure 3-1 below.
- The GCOM network must belong to the same Control Network, i.e., the GCOM network must have the same 10-digit number as the other buses in the Control Network.

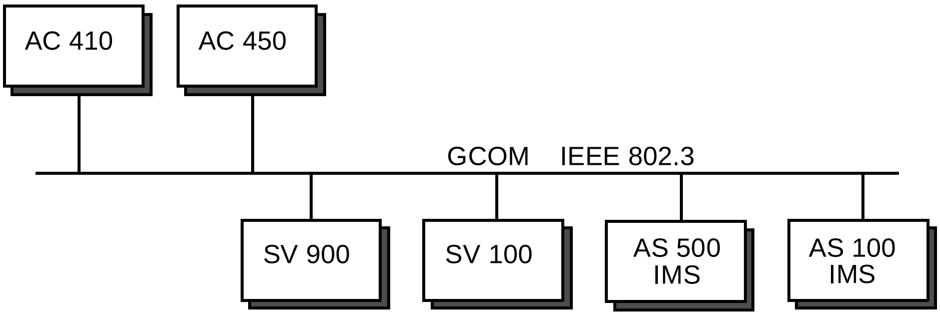


Figure 3-1. Example of a GCOM Configuration

Use GCOM to connect Advant Station 100 and 500 series IMS and external computers to MasterGate 230/1 in the plant network. In the control network, use GCOM to connect Advant Station 100 and 800 series and SuperView 900 to Advant Controller 410, Advant Controller 450 or MasterPiece 200/1. GCOM provides high-speed, high-performance communication over medium distances.

GCOM makes the same demands on the physical media as the MasterBus 300.

3.3 SC530 GCOM

NOTE

SC530 can only be used in Advant Controller 450.

3.3.1 Hardware Part List

Table 3-1. SC530 GCOM Hardware for Advant Controller 450

Item	Identity	Ordering number
Communication module	CS513	3BSE 000435
Carrier board	SC530	3BSE 003817
Terminators for trunk coaxial cable, see pictures "T1" - Termnation Set, "T2" Termination Set and Ground Connection Set	5217 423 - 19 5217 423 - 20 5217 423 - 21 2166 1922 - 1	5730 030 - HY
Joining Set for trunk coaxial cable	In Line Connector	5752 0001 - ER
Access Unit Interface cable (AUI) straight connector, 5 m length	DSTK 128	2639 0582 - BL
Access Unit Interface cable (AUI) straight connector, 15 m length	DSTK 129	2639 0582-BM
Access Unit Interface cable (AUI) angled connector, 5 m length	TK576V050	3BSC 950055R1
Access Unit Interface cable (AUI) angled connector, 15 m length	TK576V150	3BSC 950056R1
Transceiver	5751 029 - 1 and mounting details	5730 030 -VN
Tool Kit		5751 029 - 2

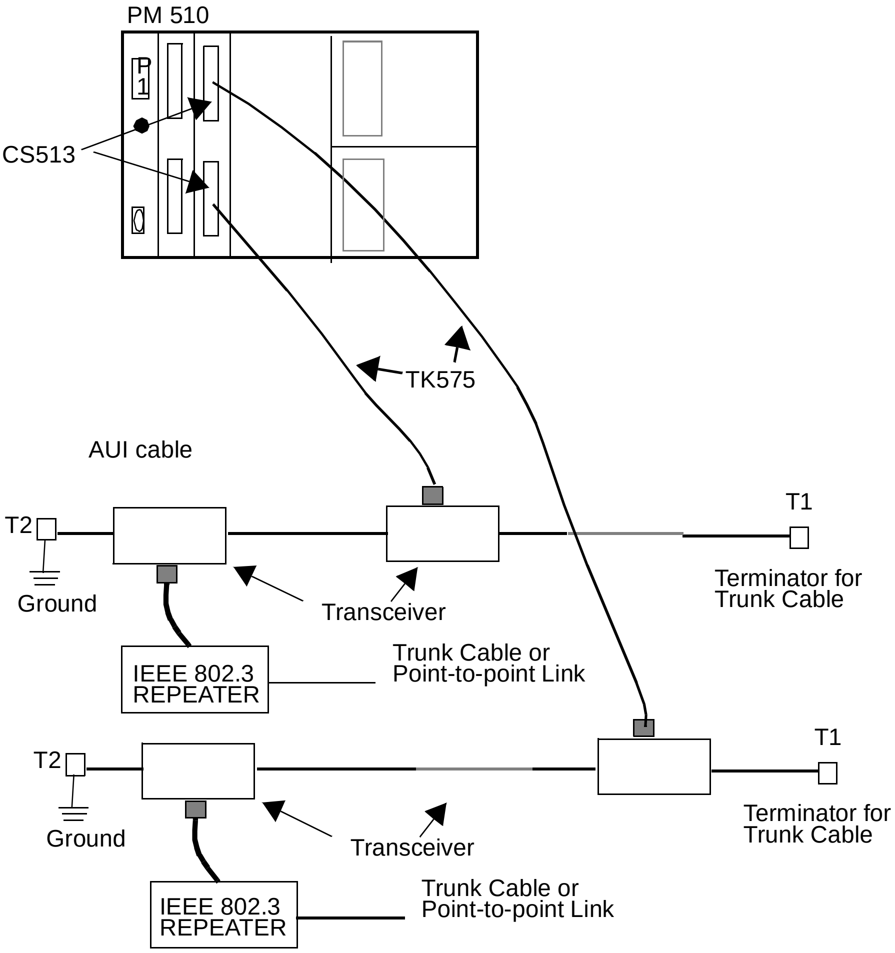

PM 510
P
1
CS513
TK575
AUI cable
T2
T1
Ground
Transceiver
Terminator for Trunk Cable
IEEE 802.3 REPEATER
Trunk Cable or Point-to-point Link
T2
T1
Ground
Transceiver
Terminator for Trunk Cable
IEEE 802.3 REPEATER
Trunk Cable or Point-to-point Link

Figure 3-2. MB 300/300E and SC530 GCOM Hardware in Advant Controller 450

Trunk Cable Attachment Set

1. Access Unit (AU) interface cable with connectors
   a. 5m cable length with TK576V050 (3BSC950055R1)
      (Note the connector on the CS 513 side is angled.)
   b. 15 m cable length with TK576V150 (3BSC950056R1)
      (Note the connector on the CS513 side is angled.)
   c. 5 m cable length with DSTK 128 (2639 0582-BL)
   d. 15 m cable length with DSTK 129 (2639 0582-BM)
   e. Transceiver **(Note: isolation must be > 2 kV)**
   f. Tap Connector Assembly Tool Kit.

2. PVC Coaxial Trunk Cable Set (for indoor use only)
    a. PVC Trunk cable with type N connectors, the length of the cable can be ordered in odd multiples of 23.4 m
    b. In-line connectors
    c. Line terminator T1 and T2
    d. Ground clamp (2166 1922-1).

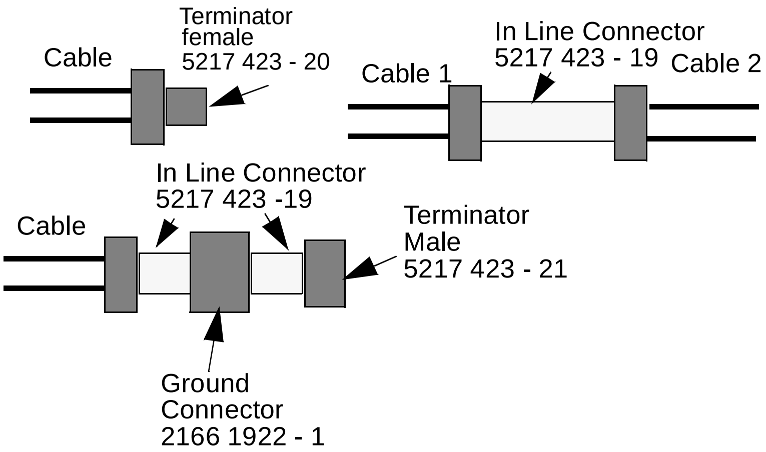


Figure 3-3. Termination Set for Trunk Coaxial Cable

3.3.2 SC530 Rack-Mounted Circuit Board

SC530 is a rack-mounted circuit board, adapted to the FB+ back-plane bus. **The board contains a CPU and memory.**

The function of SC 530 is to act as an intelligent carrier for different kinds of I/O-modules such as:

- communication modules for GCOM and MasterBus 300/300E, CS513 (LAN IEEE 802.3)
- asynchronous communication modules for CI530 series, RCOM, MVI, RS–232–C, MasterFieldBus or Advant Fieldbus 100
- memory card interface boards for system software, MB510 (PCMCIA).

You can execute higher level software that relieves the host CPU in the system of handling I/O at the lowest level, i.e., in the case of GCOM, communication parts of the protocol stack software are run on the SC530 board CPU.

The board has mechanical provisions for two I/O-modules, both inserted from the front of the SC 530. That means that you can remove or change the I/O-modules without removing the base board from the FB+ back-plane.

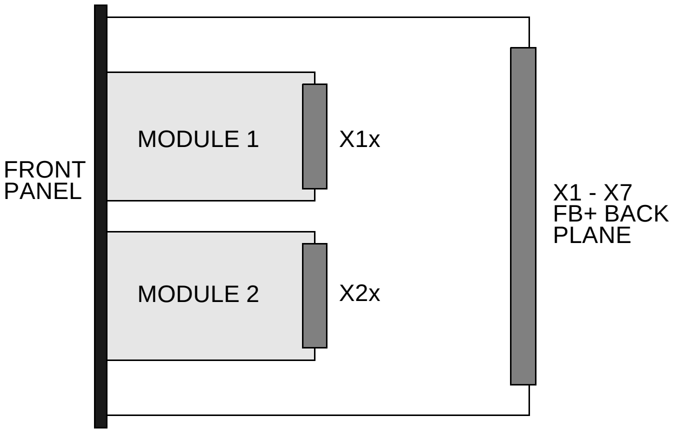


Figure 3-4. SC530 Connectors

CONNECTORS X1 - X7

The rear connectors, X1-X7, contain the connections to the FB+ back-plane.

X1x and X2x

These connectors on the base board, accessible through the front, are the connectors to the Module Interconnection Bus, MIB. The connector designated X1x corresponds to the module position 1 and X2x to module position 2. Module 1 is the upper module, as viewed from the front, and Module 2 is the lower module. See Figure 3-4.

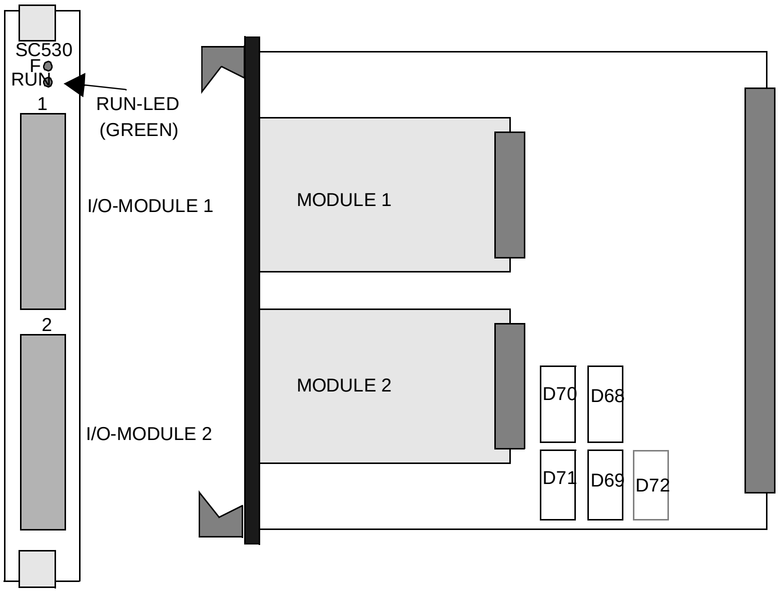


Figure 3-5. SC 530 Sockets for PROM

PROM locations

The SC530 board has five sockets for PROM located near the lower edge of the board, see Figure 3-5. Four sockets (D68-D71) are intended for the "main program memory" and the fifth socket (D72) can be used for BOOT PROM, if any. SC530 does not have any BOOT PROM.

Strappings

There are no strappings for this board.

3.3.3 CS513 Small Circuit Board adapted to the Module Interconnection Bus (MIB)

CS513 is a small circuit board adapted to the Module Interconnection Bus (MIB) and intended for insertion in various processor boards such as Advant Controller 410, SC510, SC520 and SC530 (GCOM). The board contains an Integrated Local Area Communication Controller which realizes the physical level of communication defined in the IEEE 802.3 standard.

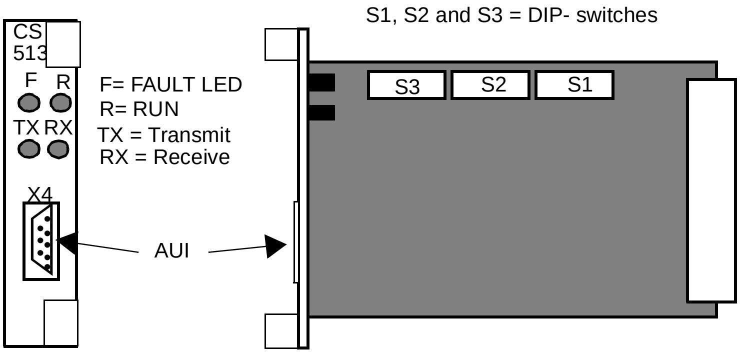


Figure 3-6. CS513

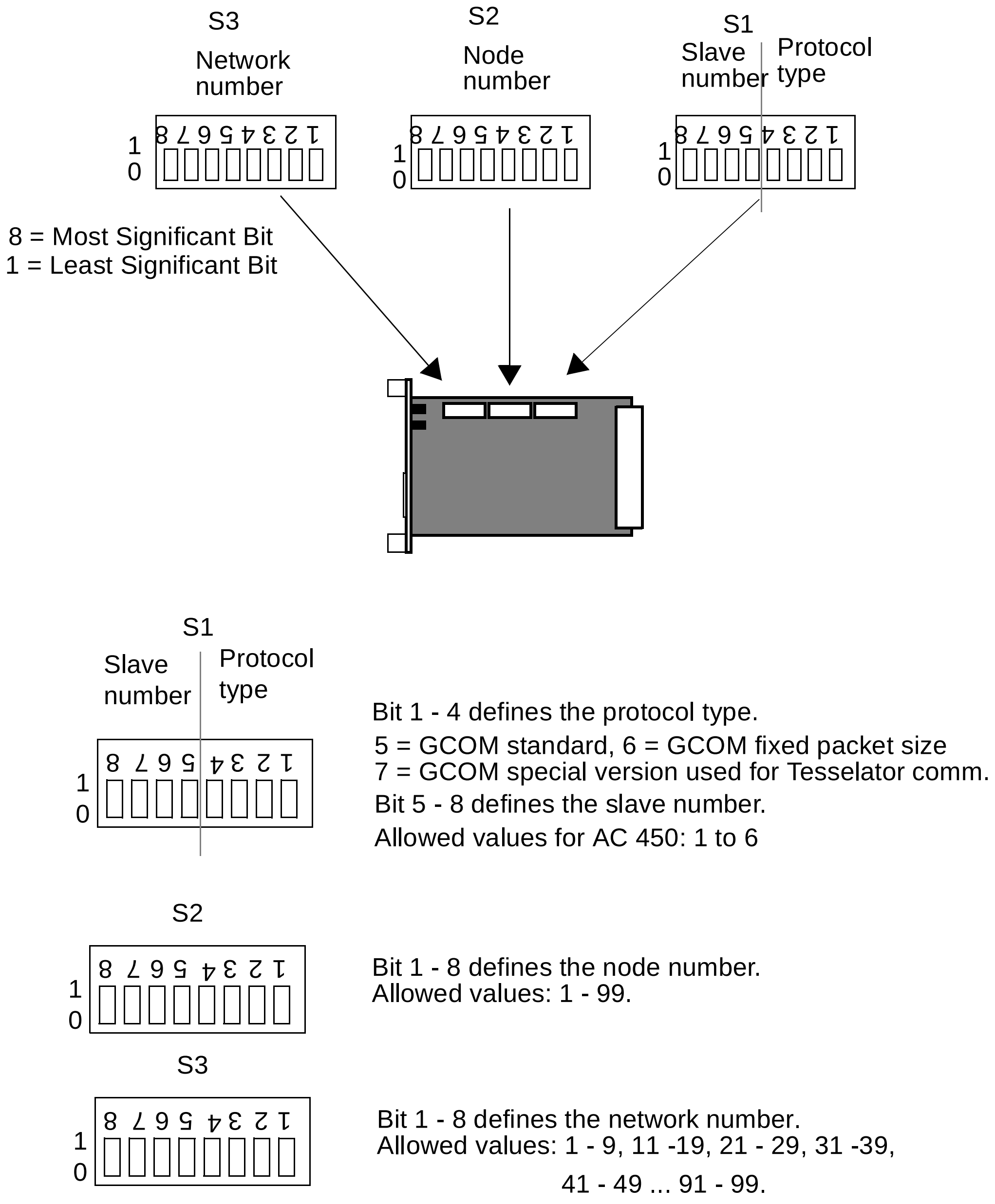
Strappings

Use the strap group S1 to select protocol type and slave number.

Use the strap group S2 to select node number.

Use the strap group S3 to select network number.

3.3.4 Strappings on CS513 for SC530 GCOM



8 = Most Significant Bit
1 = Least Significant Bit

S1

Bit 1 - 4 defines the protocol type.
5 = GCOM standard, 6 = GCOM fixed packet size
7 = GCOM special version used for Tesselator comm.
Bit 5 - 8 defines the slave number.
Allowed values for AC 450: 1 to 6

S2

Bit 1 - 8 defines the node number.
Allowed values: 1 - 99.

S3

Bit 1 - 8 defines the network number.
Allowed values: 1 - 9, 11 -19, 21 - 29, 31 -39,
41 - 49 ... 91 - 99.

Figure 3-7. CS513 Strap Groups for GCOM

3.3.5 LAN Data Base Element for SC530 GCOM

The values strapped on the CS513 communication module are transferred by the system and are reflected in the Data Base Element for CS513 LANx. Errors are reported as a value on the ERRTYPE terminal, see Figure 3-8. The terminal PROT_PAR is only used when the PROT_PAR is used to tune the time-out times when GCOM is used for communication via bridges, which introduces delays and limits the bandwidth.

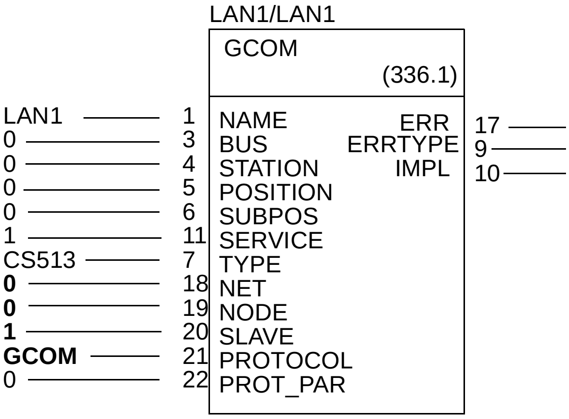


Figure 3-8. CS513 Data Base Element (LAN)

Table 3-2. Properties for the LAN Data Base Element

Terminal no.	Terminal name	Value entered by	Default value	Description
1	NAME	System	LAN1	Unique name of Data Base Element
3	BUS	Not Applicable	0	Not implemented
4	STATION	Not Applicable	0	Not implemented
5	POSITION	System	-	Carrier board position
6	SUBPOSITION	System	-	Module position on carrier board
7	TYPE	System	CS513	HW type of LAN module
9	ERRTYPE	System	00	Error type see table 00 = no error
10	IMPL	System	-	This flag is set to TRUE when communication is running and set to FALSE when communication is stopped.

Table 3-2. Properties for the LAN Data Base Element (Continued)

Terminal no.	Terminal name	Value entered by	Default value	Description
11	SERVICE	System/ User	-	This property is set to 1 when the communication is started. When it is set to 0 by the user, the communication stops.
17	ERR	System	0	Error flag which is set when an error is detected.
18	NET	System	-	Network number
19	NODE	System	-	Node number
20	SLAVE	System	0	Only slave numbers 7 and 8 are accepted in Advant Controller 410.

PROT_PAR = 0:
Acknowledge time-out for a message = 250 ms
Transit vector traffic every 1 s
Used for normal GCOM links without bridges.

PROT_PAR = 1 to 15:
Acknowledge time-out for a message = 500 ms * PROT_PAR
Transit vector traffic every 1 s * PROT_PAR

Table 3-3. Error Codes from LAN Data Base Element

Type	Code	Interpretation
ermacaddr	21	Duplicate node number on the network
ernode	22	More than one node number in the station
ercntnet	23	Station connected to more than one Control Network
ernetw	25	Network number already used in Control Network
erbus	31	Module not found or internal bus error
erhwid	32	Incorrect hardware identity on module
erinit	33	Start-up of module failed
erhw	34	Suspected hardware error
erswid	35	Incorrect software identity on module
erifid	36	Incorrect module interface identity
erhbt	39	Heart beat (SQE) error from the LAN transceiver (lost contact with the transceiver)
erslvno	50	Illegal slave number

Table 3-3. Error Codes from LAN Data Base Element (Continued)

Type	Code	Interpretation
erpositi	51	Illegal module position
erdubpos	52	Module position number already used in the Advant Controller
erdubslv	53	Two modules have the same slave number
erdubmac	54	Two LAN modules have the same slave number for MB 300/300E in host

3.4 CI543 GCOM

NOTE

CI543 GCOM can be used in both Advant Controller 410 and Advant Controller 450.

3.4.1 AC 410 with CI543 GCOM

3.4.1.1 Hardware Part List

Table 3-4. CI543 GCOM Hardware for Advant Controller 410

Item	Identity	Ordering number
Communication module	CI543	3BSE 010 699R1
Terminators for trunk coaxial cable, see pictures “T1” - Termnation Set, “T2” Termination Set and Ground Connection Set	5217 423 - 19 5217 423 - 20 5217 423 - 21 2166 1922 - 1	5730 030 - HY
Joining Set for trunk coaxial cable	In Line Connector	5752 0001 - ER
Access Unit Interface cable (AUI) straight connector, 5 m length	DSTK 128	2639 0582 - BL
Access Unit Interface cable (AUI) straight connector, 15 m length	DSTK 129	2639 0582-BM
Access Unit Interface cable (AUI) angled connector, 5 m length	TK576V050	3BSC 950055R1
Access Unit Interface cable (AUI) angled connector, 15 m length	TK576V150	3BSC 950056R1
Transceiver	5751 029 - 1 and mounting details	5730 030 -VN
Tool Kit		5751 029 - 2

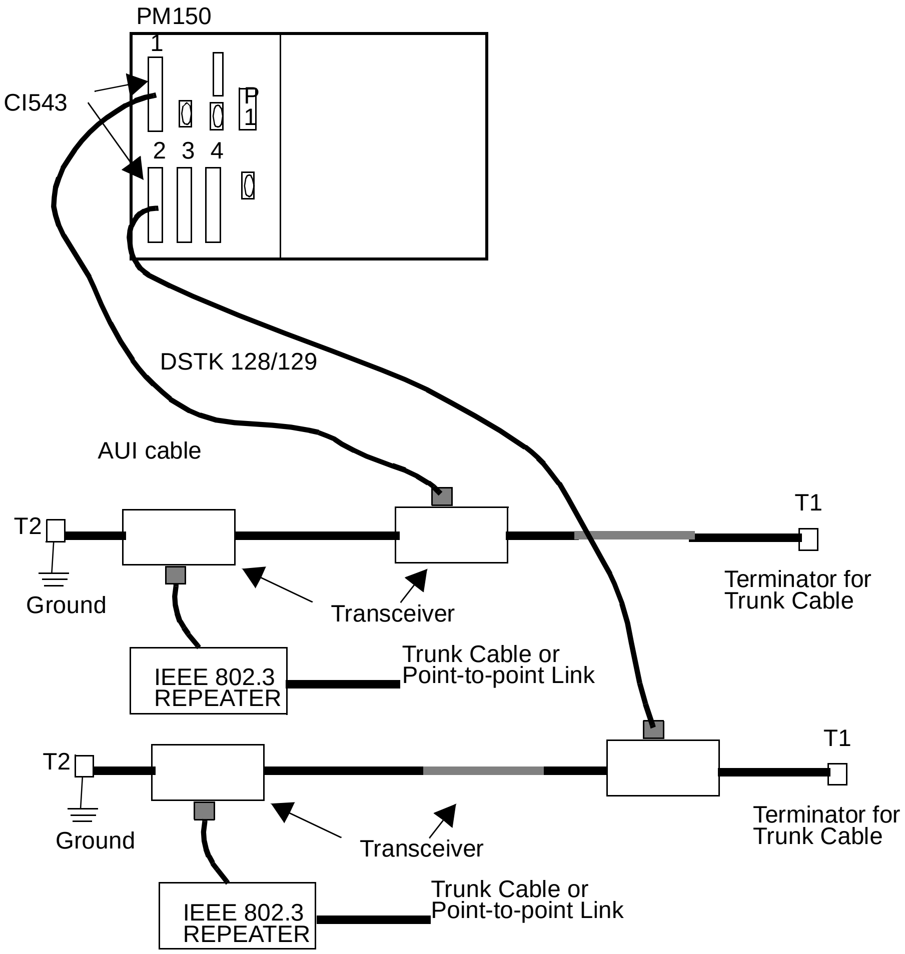

PM150
1
CI543
P
1
2 3 4
DSTK 128/129
AUI cable
T2
Ground
Transceiver
T1
Terminator for Trunk Cable
IEEE 802.3 REPEATER
Trunk Cable or Point-to-point Link
T2
Ground
Transceiver
T1
Terminator for Trunk Cable
IEEE 802.3 REPEATER
Trunk Cable or Point-to-point Link

Figure 3-9. CI543 GCOM Hardware in Advant Controller 410

The transceiver, AUI cable, trunk coaxial cable and repeaters for GCOM are commercially available products that conform with the IEEE 802.3 - 1985 standard. The Trunk Cable Attachment Set includes such products as recommended by ABB.

Trunk Cable Attachment Set

1. Access Unit (AU) interface cable with connectors
    a. 5 m cable length with DSTK 128 (2639 0582-BL)
    b. 15 m cable length with DSTK 129 (2639 0582-BM)
    c. 5m cable length with TK576V050 (3BSC950055R1) (Note the connector on the CI543 side is angled.)
    d. 15 m cable length with TK576V150 (3BSC950056R1) (Note the connector on the CI543 side is angled.)
    e. AMP Transceiver **(Note: isolation must be > 2 kV)**

   f. Tap Connector Assembly Tool Kit

2. PVC Coaxial Trunk Cable Set (for indoor use only)
   a. PVC Trunk cable with type N connectors, the length of the cable can be ordered in odd multiples of 23.4 m
   b. In-line connectors
   c. Line terminator T1 and T2
   d. Ground clamp (2166 1922-1)

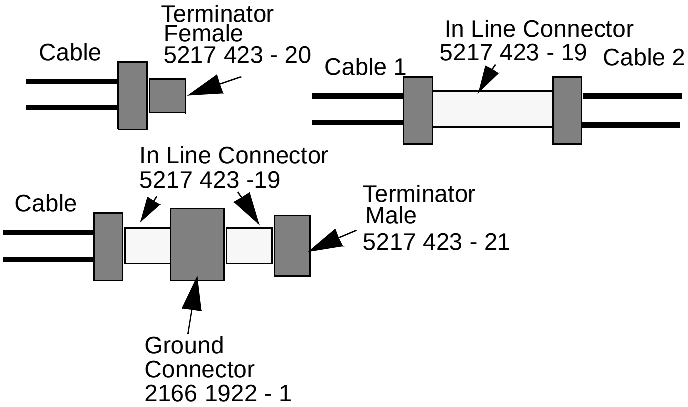


Figure 3-10. Termination Set for Trunk Coaxial Cable

3.4.2 AC 450 with CI543 GCOM

3.4.2.1 Hardware Part List

Table 3-5. CI543 GCOM Hardware for Advant Controller 450

Item	Identity	Ordering number
Communication module	CI543	3BSE 010 699R1
Carrier board	SC510	3BSE 003832
Carrier board	SC520	3BSE 003816
Terminators for trunk coaxial cable, see pictures "T1" - Termnation Set, "T2" Termination Set and Ground Connection Set	5217 423 - 19 5217 423 - 20 5217 423 - 21 2166 1922 - 1	5730 030 - HY
Joining Set for trunk coaxial cable	In Line Connector	5752 0001 - ER

Table 3-5. CI543 GCOM Hardware for Advant Controller 450 (Continued)

Item	Identity	Ordering number
Access Unit Interface cable (AUI) straight connector, 5 m length	DSTK 128	2639 0582 - BL
Access Unit Interface cable (AUI) straight connector, 15 m length	DSTK 129	2639 0582-BM
Access Unit Interface cable (AUI) angled connector, 5 m length	TK576V050	3BSC 950055R1
Access Unit Interface cable (AUI) angled connector, 15 m length	TK576V150	3BSC 950056R1
Transceiver	5751 029 - 1 and mounting details	5730 030 -VN
Tool Kit		5751 029 - 2

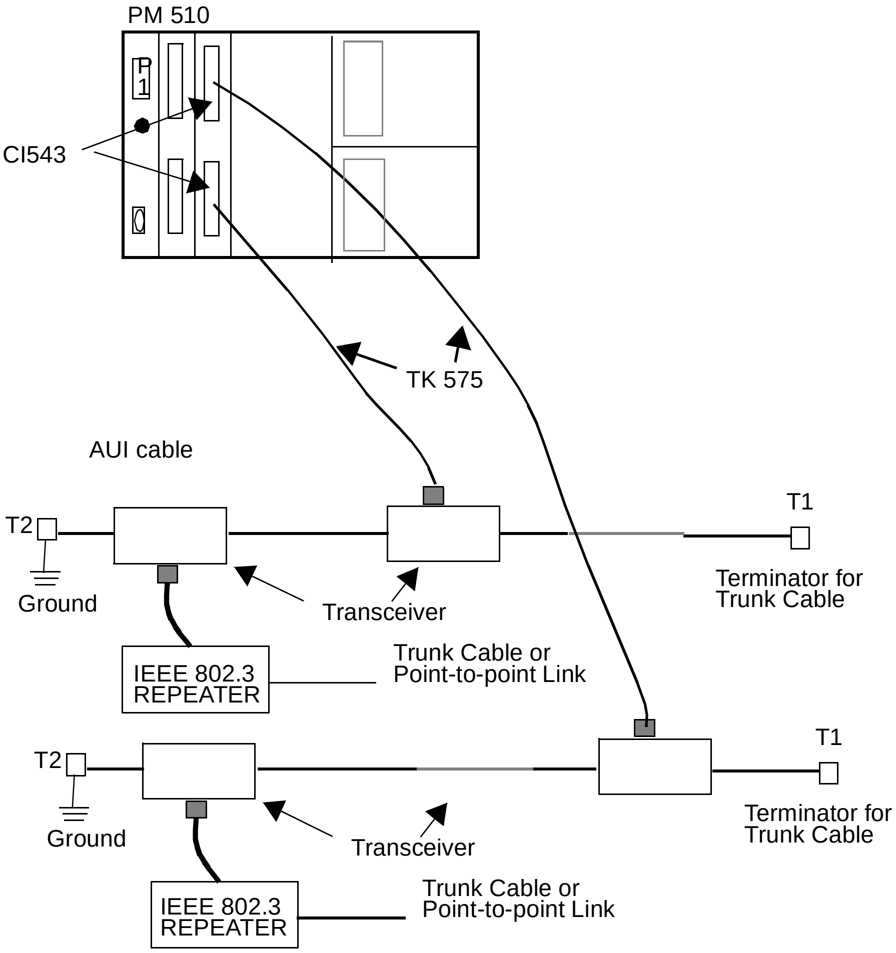

PM 510
P
1
CI543
TK 575
AUI cable
T2
Ground
Transceiver
T1
Terminator for Trunk Cable
IEEE 802.3 REPEATER
Trunk Cable or Point-to-point Link
T2
Ground
Transceiver
T1
Terminator for Trunk Cable
IEEE 802.3 REPEATER
Trunk Cable or Point-to-point Link

Figure 3-11. Example of CI543 GCOM Hardware in Advant Controller 450

Trunk Cable Attachment Set

1. Access Unit (AU) interface cable with connectors
    a. 5m cable length with TK576V050 (3BSC950055R1)
    (Note the connector on the CI543 side is angled.)
    b. 15 m cable length with TK576V150 (3BSC950056R1)
    (Note the connector on the CI543 side is angled.)
    c. 5 m cable length with DSTK 128 (2639 0582-BL)
    d. 15 m cable length with DSTK 129 (2639 0582-BM)
    e. Transceiver **(Note: isolation must be > 2 kV)**
    f. Tap Connector Assembly Tool Kit.

2. PVC Coaxial Trunk Cable Set (for indoor use only)
   a. PVC Trunk cable with type N connectors, the length of the cable can be ordered in odd multiples of 23.4 m
   b. In-line connectors
   c. Line terminator T1 and T2
   d. Ground clamp (2166 1922-1).

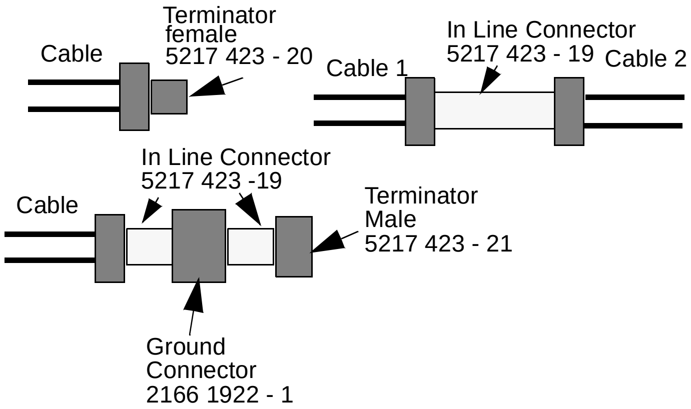

Cable
Terminator female 5217 423 - 20
Cable 1
In Line Connector 5217 423 - 19
Cable 2
Cable
In Line Connector 5217 423 -19
Terminator Male 5217 423 - 21
Ground Connector 2166 1922 - 1

Figure 3-12. Termination Set for Trunk Coaxial Cable

3.4.2.2 SC510 Rack-Mounted Circuit Board

It is possible to have two CI543 at the same time in one SC510 Rack-Mounted Circuit Board.

For more information about SC510, see the chapter SC510 Rack-Mounted Circuit Board for Masterbus 300/300E.

3.4.2.3 SC520 Rack-Mounted Circuit Board

It is possible to have two CI543 in one SC520 Rack-Mounted Circuit Board.

For more information about SC520, see the chapter SC520 Rack-Mounted Circuit Board for Masterbus 300/300E.

3.4.3 CI543 Small Circuit Board Adapted to the Module Interconnection Bus (MIB)

CI543 is a small circuit board adapted to the Module Interconnection Bus (MIB) and intended for insertion in various processor boards such as Advant Controller 410, SC510 and SC520. The board contains:

- a CPU (MC68360)
- an integrated Local Area Communication Controller which realizes the physical level of communication defined in IEEE 802.3 standard

- RWM
- PROM which contains the GCOM communication stack.

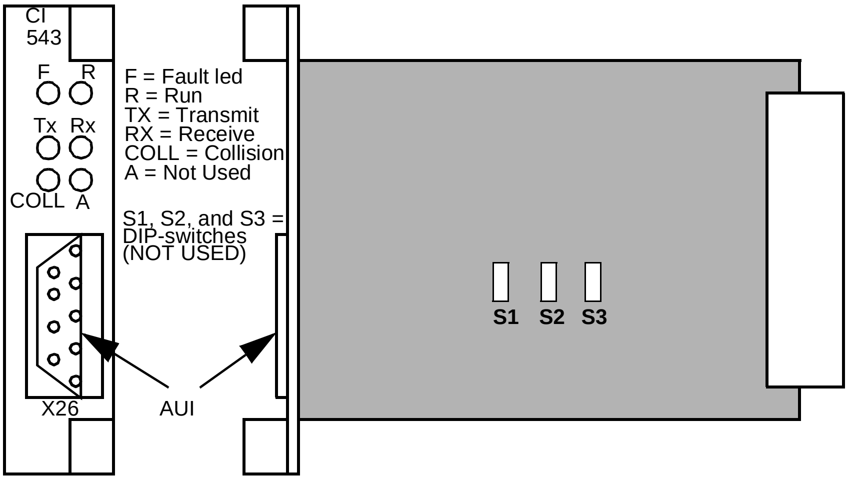


Figure 3-13. CI543

DIP-Switches

The DIP-switches S1, S2, and S3 are NOT used, all configuration is made with the GCOM Database element.

CAUTION

Always disconnect the transceiver cable (DSTK 128/129, TK 576Vxxx) from the X26 contact of CI543 before inserting or removing CI543.

3.4.4 GCOM CI543 Configuration

All configuration is made with GCOM CI543 Database element. The user has to give a name of the element, specify the network and node number, specify position and subposition of the MIB module and set the implemented and service flags to true (1) to start GCOM. The communication parameters protocol type, protocol parameter and transceiver queue size are assigned default values, suitable for most installations.

If a user wants to change one of the properties

- NET
- NODE
- PROTTYPE
- PROTPAR
- QUESIZE

when CI543 is running, CI543 must be restarted to be reconfigured.

GCOM CI543 Database element

The GCOM data base element specifies the Multi Vendor Interface module. The element contains information used to configure GCOM CI543. In an AC400 node maximum 5 GCOM data base elements can be created.

Item designation	MVIx
Element Type	GCOM
Call Name	CI543

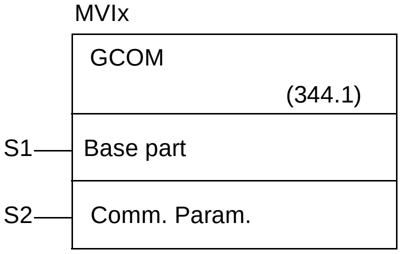


Figure 3-14. DB element CI543 GCOM

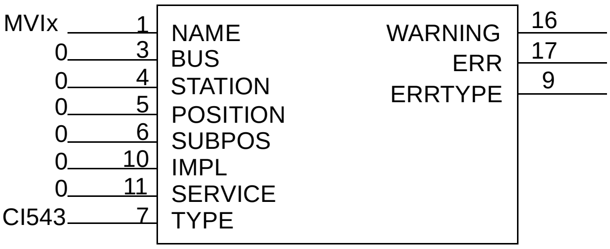


Figure 3-15. DB element, CI543 GCOM - Base Part

Table 3-6. Description of the DB element CI543 GCOM - base part

Terminal No Name	Value entered by	Default value	Allowed values	Description
1 NAME	user	MVIx	MVI1-MVI5	Unique name of the element.
3 BUS	Not Applicable	0		Not implemented
4 STATION	Not Applicable	0		Not implemented
5 POSITION	user	0	AC 410: 0 -1 AC 450: 0 - 14	Position of carrier module in rack.
6 SUBPOS	user	0	AC 410: 0 - 4 AC 450: 0 - 2	Subposition of CI543 in carrier module.

Table 3-6. Description of the DB element CI543 GCOM - base part (Continued)

Terminal No Name	Value entered by	Default value	Allowed values	Description
10 IMPL	user	0	0, 1	This should be set to 1 when all configuration parameters are entered in the database element.
11 SERVICE	user	0	0, 1	Set this flag to 1 to start GCOM. If the flag is set to 0, GCOM is stopped.
7 TYPE	predefined.	13	-	Hardware type designation.
16 WARNING	Not Applicable	0		Not implemented
17 ERR	system	0	-	Error flag which is set when an error is detected.
9 ERRTYPE	system	0	-	Error type, see table. 00 = no error.

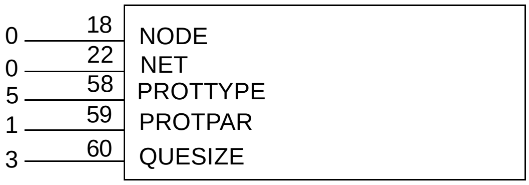


Figure 3-16. DB element CI543 GCOM - Communication Parameters

Table 3-7. Description of the DB element CI543 GCOM - Communication parameters

Terminal No Name	Value entered by	Default value	Allowed values	Description
18 NODE	user	0	1 - 99	Node number of the controller.
22 NET	user	0	11-19, 21-29, 31-39, ..., 91-99	Network number
58 PROTTYPE	user	5	5 - 7	Protocol type, 5 = GCOM Standard, variable packet size 6 = GCOM Fixed packet size 7 = GCOM Tesselator

Table 3-7. Description of the DB element CI543 GCOM - Communication parameters (Continued)

Terminal No Name	Value entered by	Default value	Allowed values	Description
59 PROTPAR	user	0	0 - 15	Protocol parameter. Protocol parameter is used to tune the time-out times when GCOM is used via bridges, which introduces delays and limits the bandwidth (se table below).
60 QUESIZE	user	3	1 - 15	The size of the message queue between the host processor and GCOM on CI543.

Table 3-8. Protocol parameter and time-outs

PROT_PAR	Transit vector traffic		Acknowledge time-out for a message		
	tsend	treceive	t1	t2	t3
0	1.0	3.0	0.25	0.5	0.5
1	1.0	3.0	0.5	1.0	1.5
2	2.0	6.0	1.0	2.0	3.0
3	3.0	9.0	1.5	3.0	4.5
4	4.0	12.0	2.0	4.0	6.0
5	5.0	15.0	2.5	5.0	7.5
6	6.0	18.0	3.0	6.0	9.0
7	7.0	21.0	3.5	7.0	10.5
8	8.0	24.0	4.0	8.0	12.0
9	9.0	27.0	4.5	9.0	13.5
10	10.0	30.0	5.0	10.0	15.0
11	11.0	33.0	5.5	11.0	16.5
12	12.0	36.0	6.0	12.0	18.0
13	13.0	39.0	6.5	13.0	19.5
14	14.0	42.0	7.0	14.0	21.0
15	15.0	45.0	7.5	15.0	22.5

• ***tsend***	Time in seconds between two transit vectors.
• ***treceive***	time-out in seconds to detect that a node is disconnected if no transit vector is received.
• ***t1***	time-out in seconds between the transmission and the first retransmission.
• ***t2***	time-out in seconds between the first retransmission and the second retransmission.
• ***t3***	time-out in seconds between the second (and last) retransmission and the time to drop the message.

Table 3-9. Error Codes from GCOM Data Base Element

Type	Code	Interpretation
ermacaddr	21	Duplicate node number on the network
ernode	22	More than one node number in the station
ercntnet	23	Station connected to more than one Control Network
ernetw	25	Network number already used in Control Network
erbus	31	Module not found or internal bus error
erhwid	32	Incorrect hardware identity on module
erinit	33	Start-up of module failed
erhw	34	Suspected hardware error
erpositi	51	Illegal module position
erdubpos	52	Module position number already used in the Advant Controller

3.5 GCOM IEEE 802.3 Hardware in MP 200/1 and MG 230/1

Use the communication board DSCS 150 in MasterPiece 200/1 and MasterGate 230/1. Please refer to *MasterGate 230/1 Installation and Error Codes* for a description of DSCS 150 hardware.

Chapter 4 Configuration/Application Building

4.1 Design Considerations

4.1.1 Network Structures

An ABB Maser distributed control system consists of a number of MasterPiece, MasterView, Advant Station 500 series or Advant Controller 400 series stations linked together via MasterNet. Such a structure is called a Control Network.

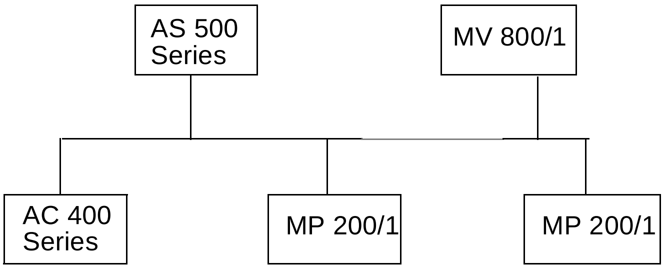


Figure 4-1. Advant OCS Control Network

Subordinated to the MasterPiece 200 or Advant Controller 400 series stations in a control network, the system may include one or more Local Control Networks corresponding to a process section or a group of machines. These networks are local to the respective MasterPiece 200 or Advant Station 400 series stations. Stations in a local control network can only communicate with stations connected to the same link, except for MasterBus 300E, which can also communicate to stations on the Control Network.

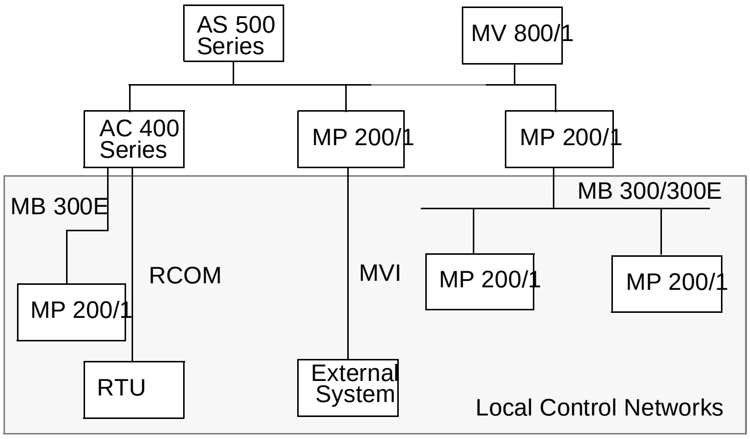


Figure 4-2. Advant OCS Local Control Network

You can interconnect separate Control Networks via MasterGate 230/1 to form a Plant Network.

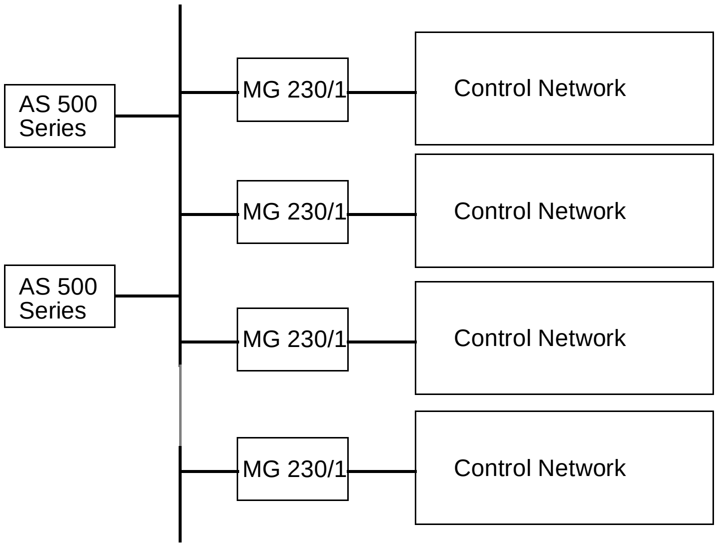


Figure 4-3. Advant OCS Plant Network

4.1.2 Configuration Rules

An Advant OCS system is organized in accordance with the network structures described above. The following general configuration rules apply:

- You can connect a maximum of nine Control Networks in a Plant Network.
- A Plant Network consists of one bus (plus one optional redundant bus) of the type MasterBus 300.
- On the Plant Network, MasterBus 300/300E protocol can coexist on the same physical cable with other protocols such as GCOM and TCP/IP, provided you consider the information below.
    e. The Advant OCS stations receive all broadcast messages sent from the alien system as well as all the group address messages passing through a group address filter. This reduces ABB Master's performance because buffers are occupied for these messages until they are de-allocated by the Medium Access Control (MAC) layer in the MasterBus datalink handler.
    f. All Advant OCS stations periodically send routing vectors with group address (multicast frames), which may reduce performance in the alien computer system.
    g. System performance is reduced by the relative decrease in bandwidth for MasterBus. System performance figures presented in this document or in any other Advant OCS document are not guaranteed.
- A Control Network can consist of up to nine buses of the type MasterBus 200 or 300.
- You can connect a Local Control Network to each MasterPiece 200 or Advant Controller 400 series station in a Control Network.

- A Control Network can contain up to 99 stations, including those connected in Local Control Networks.
- A Local Control Network can consist of up to nine buses of the type MasterBus 200 or MasterBus 300E.
- A Control Network consisting of MasterBus 300/300E can contain no more than 45 nodes.
- A bus of the type MasterBus 300 can contain no more than 45 nodes.
- A MasterBus 300 board, DSCS 140, or MasterBus 300E board, DSCS 145, can set up connections to no more than 44 other boards.
- A bus of the type MasterBus 200 can contain no more than 10 stations.
- The maximum number of MasterBus connections supported by each type of Advant OCS station is defined below:

Table 4-1. Advant OCS Stations and MasterBus

Type	MasterBus 200	MasterBus 300/ 300E	Max. total
MasterPiece 100	1	-	1
MasterPiece 100T	1	-	1
MasterPiece 2X0	4	-	4
MasterPiece 200/1	4	2 + 2 (6)(1)	6
MasterView 820	2	-	2
MasterView 810/1	1	-	1
MasterView 830/1	1	1	1
MasterView 850/1	4	2	5(2)
MasterGate 100	1	-	1
MasterGate 210/215	1	-	1
MasterGate 230/1	4	4	8
Advant Controller 410	-	2	2
Advant Controller 450	-	4 + 2	6

(1) The maximum total number of boards of type DSCS 140, DSCS 145, DSCS 150, DSCA 180 or DSCS 180X is six.

(2) Maximum three communication boards

- Buses within a Local Control Network are numbered 01-09.

- Buses within a Control Network are numbered:
    - 11-19 for Control Network 1
    - 21-29 for Control Network 2
    - ....
    - 91-99 for Control Network 9
- Buses in the Plant Network are numbered 100-127
- Buses interconnecting Control Networks are numbered 124-127
- Each station in a Control Network (including those connected in Local Control Networks) is identified with a unique node number (1-99).

Each station in the Plant Network is identified with a unique node number (1-99). MasterGate 230/1 nodes are numbered 1-9, Advant Station 500 nodes must have a node number greater than 9. External computers in the Plant Network have node numbers 10-99.

Within a Control Network, the MasterGate 230/1 is always addressed with node number **127**. In the Plant Network, each MasterGate 230/1 is addressed with a node number equal to the corresponding Control Network. In contrast to normal stations, MasterGate 230/1 always has two node numbers.

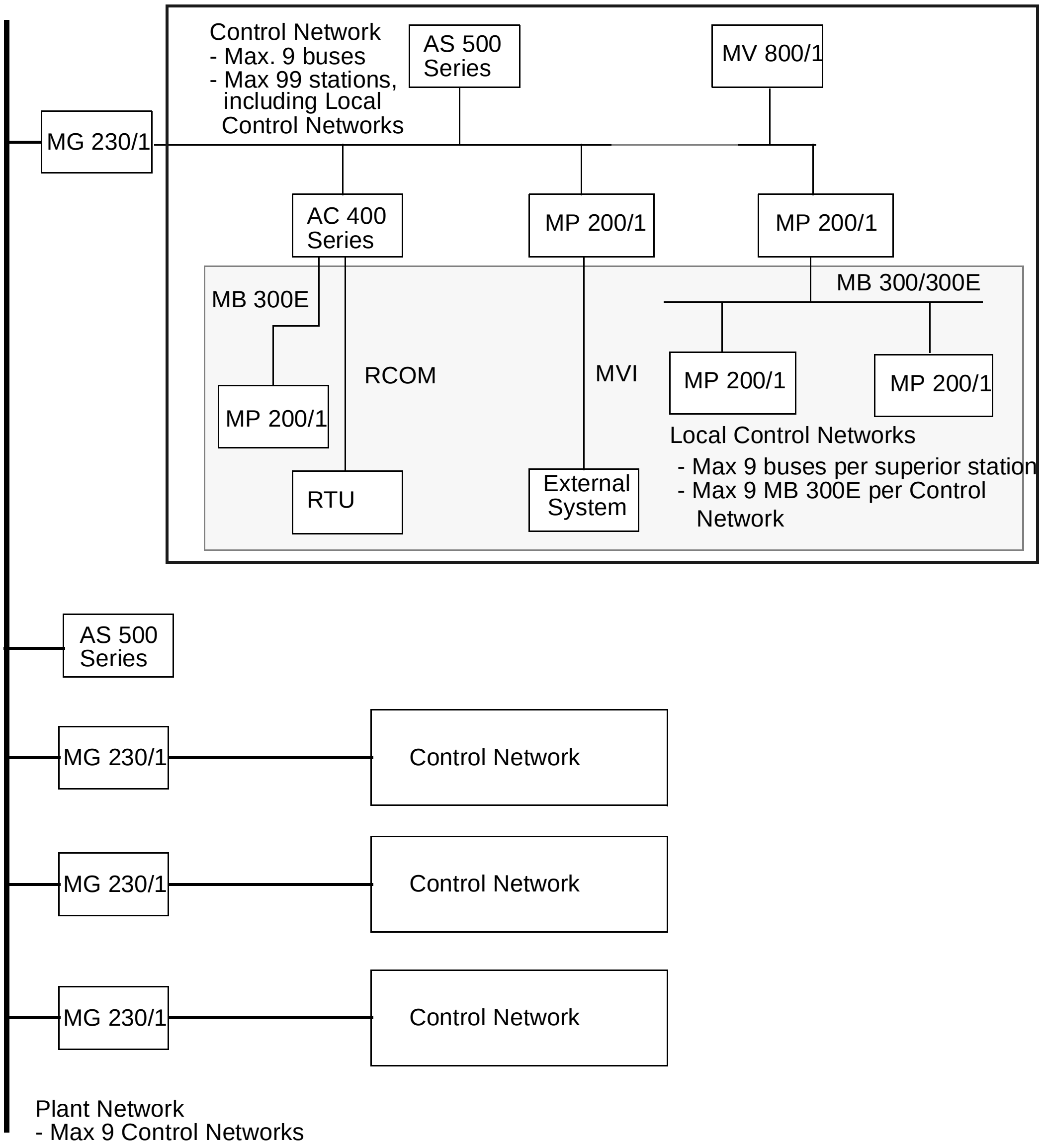


Figure 4-4. ABB MasterNet Configuration Rules Summary.

4.1.2.1 Control Network

The basic Control Network configuration consists of one MasterView 800 or Advant Station 500 series with one or several MasterPiece 200/1 or Advant Controller 410/450, connected to one another with MasterBus 200 or 300/300E. When you use MasterBus 200, MasterView is always the bus master.

You can also connect a SuperView or an IMS 800 via a GCOM bus directly to a MasterPiece 200/1 or Advant Controller 400 series in the Control Network without the intermediate MasterGate 230/1.

NOTE

Advant Station 500 Series and Advant Controller 400 series can communicate only via MasterBus 300/300E.

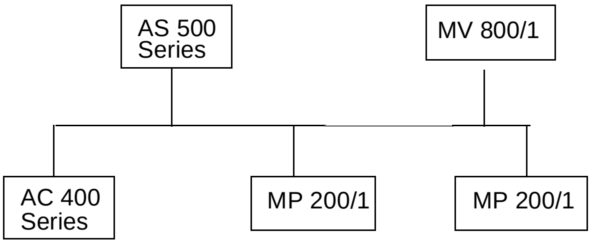


Figure 4-5. Basic Control Network Configuration

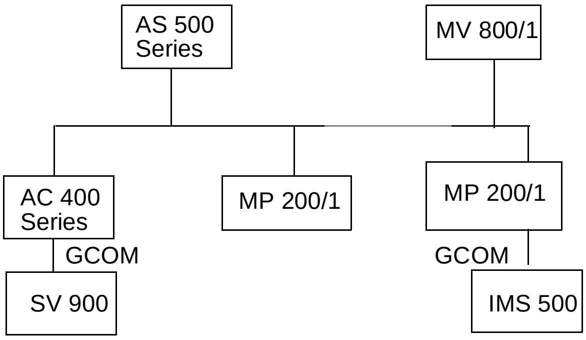


Figure 4-6. GCOM within the Control Network

For performance reasons, if the bus connected to MasterView is of the type MasterBus 200, do not use it for communication between MasterPiece stations. Instead, use a separate bus dedicated for MasterPiece-to-MasterPiece communication.

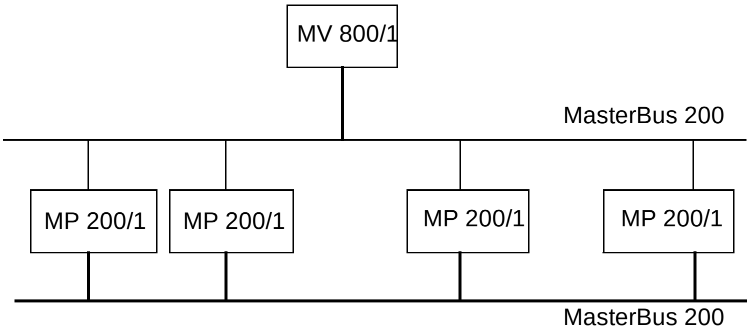


Figure 4-7. Dedicated Bus for MasterPiece-to-MasterPiece Communication

You can duplicate one or several buses in a Control Network when necessary, as long as the maximum number of buses allowed in the network and the maximum number of buses allowed to be connected to each station are not exceeded.

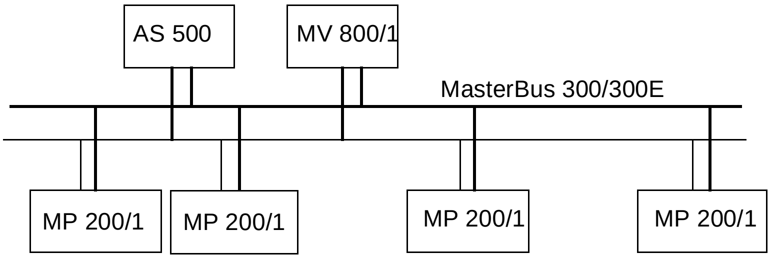


Figure 4-8. Redundant Buses with MasterBus 300/300E

NOTE

In Figure 4-7, all MasterPiece stations are connected to both buses, while the MasterView stations are connected to one bus each. This is necessary for the MasterBus 200. With MasterBus 300/300E, both MasterView and Advant Station 500 stations can be connected to both buses.

NOTE

The type of bus redundancy described here concerns the **whole** bus, including communication units, modems and cable. In addition, MasterBus 200 lets you duplicate the cable and the modems within each MasterBus 200 link.

Communication within a Control Network between a station connected to a MasterBus 200 bus and a station connected to a MasterBus 300/300E bus is restricted for reasons related to MasterBus 200's performance. There can be communication, however, via an intermediate MasterGate 230/1 or MasterPiece 200/1 station, connected to both buses.

Select one of the alternatives, listed in order of preference, below:

- Connect MasterGate 230/1 directly to the MasterBus 300/300E bus(es) and to both the dedicated and the central MasterBus 200 bus(es).

- Connect one MasterPiece 200/1 directly to the MasterBus 300 and to the dedicated MasterBus 200 bus(es). Connect another MasterPiece 200/1 directly to the central MasterBus 200 bus(es) and to the MasterBus 300/300E bus(es).
- If redundant intermediate stations interconnect the same pair of MasterBus 200 and MasterBus 300/300E buses, then use redundant MasterBus 300 buses. Connect each intermediate station to both the MasterBus 300/300E buses. If the redundant MasterBus 300/300E segment located between the two intermediate nodes fails, then communication between a station connected to the MasterBus 200 bus(es) and a station connected to the MasterBus 300 may not be possible. However, communication between stations connected to the MasterBus 300/300E is never transited via MasterBus 200.

4.1.2.2 Local Control Network

You can connect a Local Control Network, consisting of up to nine buses of type MVI (Multi Vendor Interface), MasterBus 200 or MasterBus 300E, to any MasterPiece 200/1 station in a Control Network. This structure is intended for machine and small process control applications, for local control of limited process sections or to interconnect two MB300 networks via a MB300E network. Please refer to Section 4.1.2.8, Major MB 300/Major MB 300 Configuration.

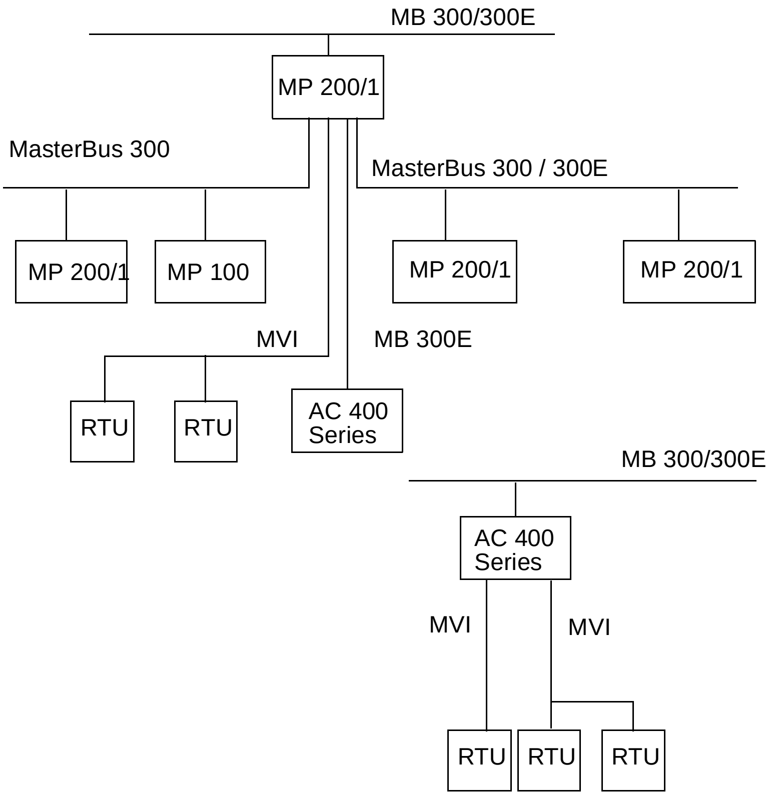


Figure 4-9. Local Control Network Configuration

Communication in a Local Control Network is possible only between stations connected to the same bus, if the bus is of type MB200.

MasterBus 300E can use the Local Control Network network numbers (01-09). This feature is mainly intended for interconnecting MasterBus 300 networks using communication bridges and slower communication speeds between the bridges, see Section 4.1.2.8, Major MB 300/Major MB 300 Configuration.

NOTE

In contrast to stations connected to a MasterBus 200, MasterBus 300E stations can communicate with the stations connected on the Control Network directly.

You can duplicate one or several buses of the type MasterBus 200, MasterBus 300/300E or MVI in a Local Control Network when necessary, as long as the maximum number of buses allowed in the network and the maximum number of buses allowed to be connected to each station are not exceeded.

Note that the type of bus redundancy described here concerns the whole bus, including communication units, modems and cable. In addition, with MasterBus 200, you can also duplicate the cable and the modems within each MasterBus 200 link.

For reasons related to MasterBus 200's performance, do not use MasterBus 200 in parallel with MasterBus 300E. If you do, if MasterBus 300E fails, the redundant MasterBus 200 cannot support the increased bus load.

4.1.2.3 GCOM IEEE 802.3 Network

The characteristics for the GCOM multidrop IEEE 802.3 bus are as follows:

- The multidrop link has an IEEE 802.2 class 1, connectionless unconfirmed data link service and IEEE 802.3 CSMA/CD medium access control. This means that there is no specific master station and that all stations have equal access to the bus. The transmission rate is 10 Mbit/s. The bus can handle up to four (4) computers, see Figure 4-10 below.
- The GCOM network must belong to the same Control Network, i.e., the GCOM network must have the same 10-digit number as the other buses in the Control Network.

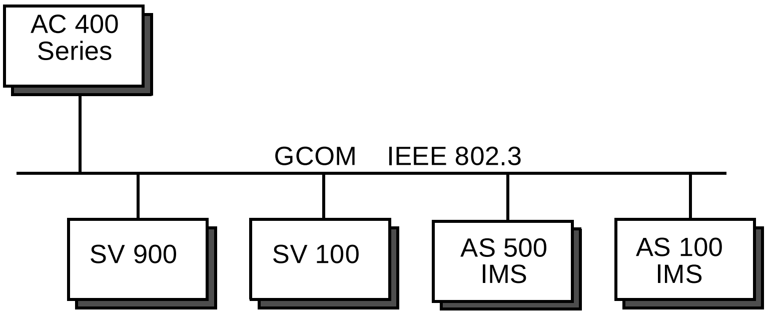


Figure 4-10. Example of a GCOM Configuration

4.1.2.4 Plant Network

Advant OCS gateways are called MasterGate. MasterGate is a group of products you can use to connect alien computers and communication systems to ABB Master. You can also use MasterGate 230/1 to interconnect separate Advant OCS Control Networks into a Plant Network. Communication with, for example, a central plant computer such as ABB SuperView is accomplished by means of the GCOM protocol via a MasterGate 230/1 connected to the bus(es) of one Advant OCS Control Network (see Figure 4-11).

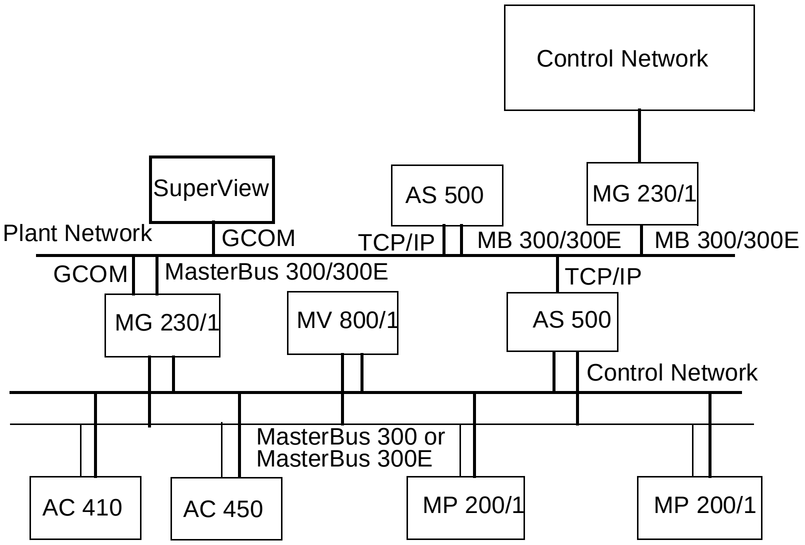


Figure 4-11. Connecting ABB SuperView via MasterGate 230/1

NOTE

When you use MasterBus 200 in a Control Network, MasterView 800 **must** always be the bus master. When you use redundant buses in the Plant Network, all MasterGate 230/1s **mus**t be connected to **both** buses.

Please note that external computer systems and the Advant Station 500 TCP/IP LAN are connected to the same physical IEEE 802.3 - 1985 bus as the MasterBus 300/300E on the Plant Network. This influences system communication performance for the following reasons:

- The Advant OCS stations receive all broadcast messages sent from the alien system, as well as all the group address messages passing through a group address filter. This reduces Advant OCS performance since buffers are occupied for these messages until they are de-allocated by the Medium Access Control (MAC) layer in the MasterBus 300/300E datalink handler.
- All Advant OCS stations periodically (once a second) send routing vectors with group address (multicast), which may reduce performance in the alien computer system.
- System performance is reduced by the relative decrease in bandwidth for MasterBus 300/300E. System performance figures presented in this document or in any other Advant OCS document are not guaranteed.

The Masterbus 300/300E protocol has been proven to be tolerated by, and tolerant of, the following protocols:

- TCP/IP
- DECNET phase IV and V
- IPX
- AppleTalk
- XNS
- SNA over ethernet.

By using communication bridges which act as a filter between the network segments, you can separate the ABB MasterBus 300/300E communication from the rest of the Plant Network.

4.1.2.5 External Communication

The Multi Vendor Interface provides communication with control equipment from other manufacturers' protocols. The relations between data references in the external system and Advant OCS are specified in the MasterPiece 200/1 or Advant Controller 400 series using ABB Master Programming Language and Multi Vendor Data Sets.

For further information see *MultiVendor Interface Development Environment*.

NOTE

You can connect the Multi Vendor Interface communication only in a Local Control Network, i.e., subordinated to a MasterPiece 200 station.

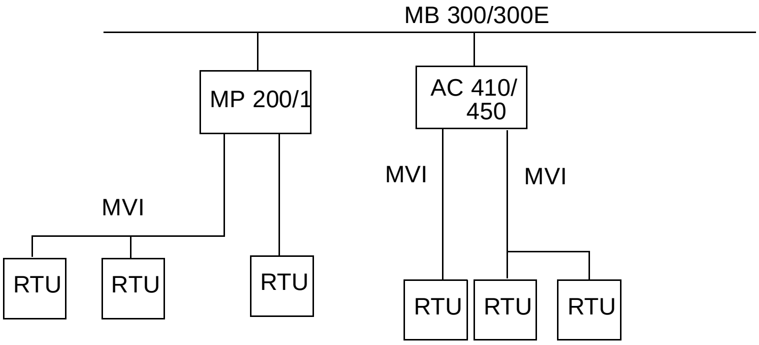


Figure 4-12. Connecting External Equipment

4.1.2.6 Minor MasterBus 300E Configuration

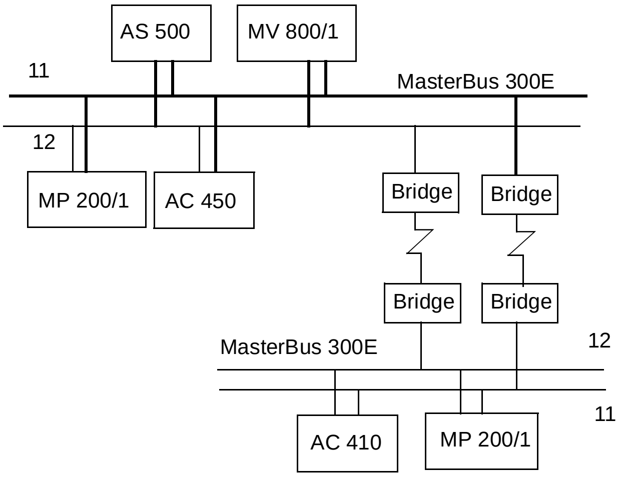


Figure 4-13. Minor MasterBus 300E Configuration

You can interconnect MasterBus 300E segments directly via data link bridges if:

- the configuration consists of few nodes
- all of the /1 nodes are equipped with the communication board DSCS 145, and
- the AS 500 is configured via the NL Data base element for MasterBus 300E.

The communication requirements between the segments should be moderate regarding the bandwidth of the intermediate link.

4.1.2.7 Major MB 300 / Minor MB 300E Configuration

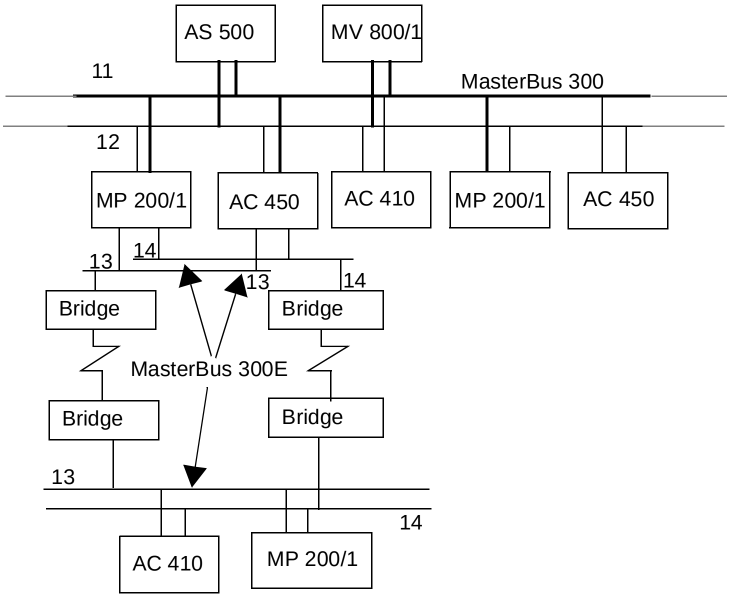


Figure 4-14. Major MB 300/Minor MB 300E Configuration

When you connect a minor MasterBus 300E network to a big MasterBus 300 network, use transition nodes since MasterBus 300 and MasterBus 300E are considered two different types of networks, i.e., a DSCS 140 cannot communicate with a DSCS 145.

You can use transit nodes to reduce the number of transport connections and thereby the basic load on the slower communication link between the bridges. You can have redundant transit nodes.

In this configuration, you can have communication between nodes on net 11 or 12 and 13 or 14, i.e., you can get dynamic updates (from objects in the nodes on network 13 and 14) on the display in an Operator Station, and Data Sets are specified with the end-station address.

4.1.2.8 Major MB 300/Major MB 300 Configuration

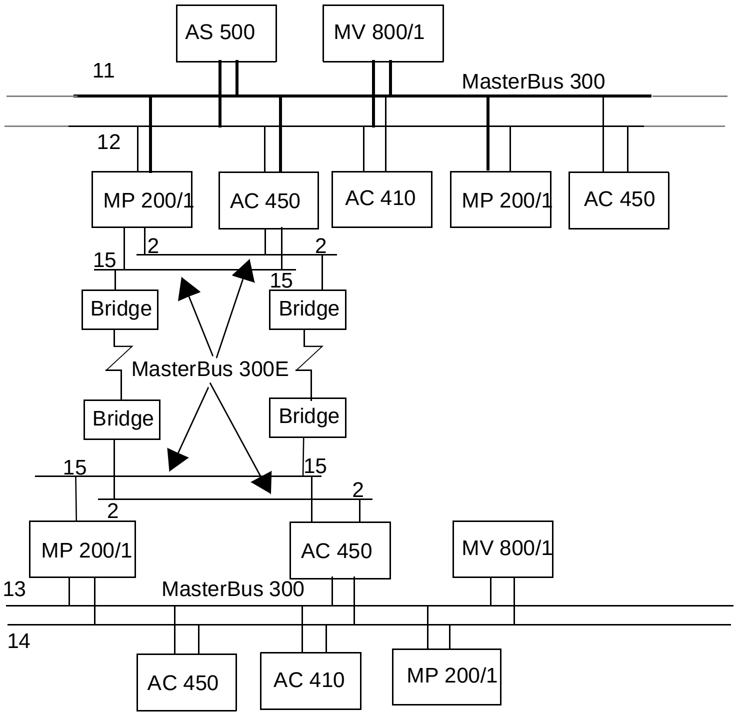


Figure 4-15. Major MB 300/Major MB 300 Configuration

When you interconnect two large MasterBus 300 networks, you must use two transit nodes. You are allowed to name the MasterBus 300E network as you would a Local Control Network (i.e., 1-9) or as a Control Network number. You can have redundant transit nodes.

In this configuration, you can have communication between nodes on net 11 or 12 and 13 or 14, i.e., you can get dynamic updates—from objects in the nodes on network 13 and 14—on the display in an Operator Station, and Data Sets are specified with the end-station address.

Transport connections are established between nodes on the networks 11/12 and 13/14 to the transit nodes. Only three transport connections are then established between the transit nodes on the MasterBus 300E networks 1/2, one per signal priority. This reduces the communication load on the bridged network.

4.2 Capacity and Performance

4.2.1 MasterBus 300 Performance

MasterBus 300 has the following capacity.

- Up to 44 stations, of the types MasterPiece 200/1, MasterView 800/1, Advant Station 500 series or Advant Controller 400 series, per bus

- One MasterGate 230/1 station per bus
- The maximum permissible distance between end nodes depends upon the configuration, as follows:
  - Maximum of 500 m (1640 ft.) coax segments without repeater
  - Maximum of 2500 m (1.56 miles) with three coax segments, four repeater sets and two point-to-point lines, also called link segments (500 m each)
  - Maximum of 3500 m (2.18 miles) using fiber optic cable in the link segments
  - Maximum of 4500 m (2.8 miles) using active star couplers and fiber optic cable
- Up to two buses connected to MasterPiece 200/1, MasterView 800/1, Advant Station 500 series, Advant Controller 400 series or MasterGate 230/1 in a Control Network
- Up to two buses connected to MasterGate 230/1 in the Plant Network
- Speed 10 Mbits/sec.

As an example of MasterBus 300 access delay, the following diagram shows MasterBus 300 "response time" with varying bus loads. The bus load is generated from a number of "pairs of nodes" connected to the MasterBus 300. Both nodes within each pair send messages (packet size on the bus = 256 byte) to each other. The bus load in each test run is increased by adding a new "pair of nodes" to the bus. In order to measure the "response time," 3000 loops are generated between two application tasks in two nodes. Each loop completes before the next is started. The time to complete one loop is presented below.

NOTE

The only load in the two nodes is generated from these two application tasks, i.e., the two nodes are exclusively used by these two tasks.

NOTE

The MasterBus 300 bus load must not exceed 2000 signals per second because, if it does, the response time increases drastically.

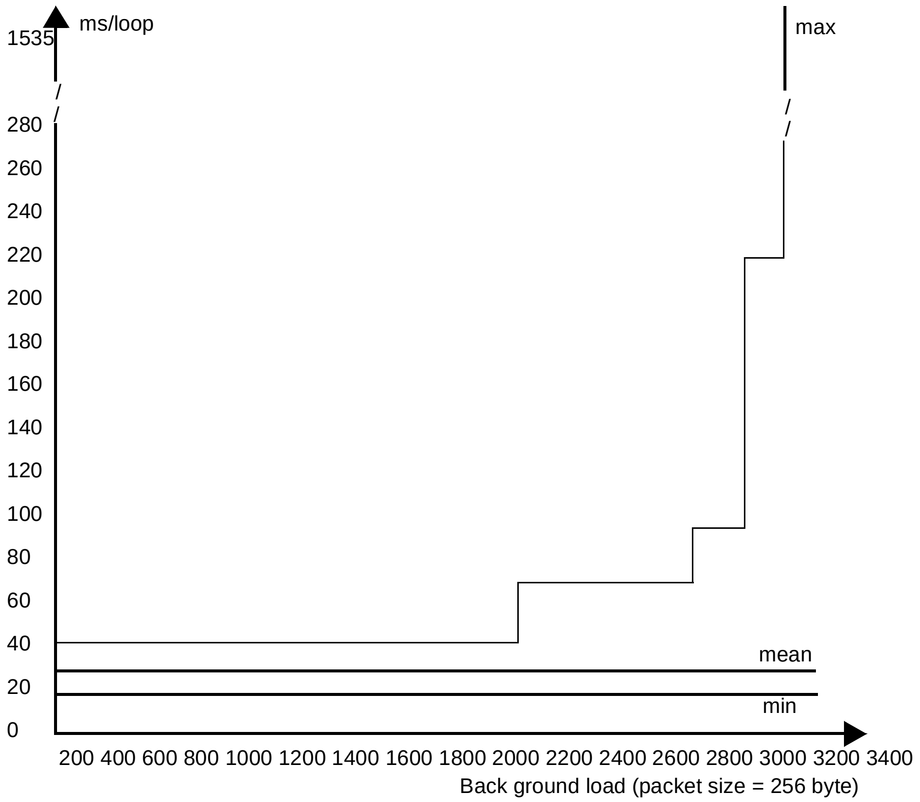


Figure 4-16. MasterBus 300 "Response Time" (Example only)

The real bus capacity is higher than presented in the diagram above (because of communication overhead in the form of transport layer acknowledge packets). In the test above, one transport acknowledge packet is sent on the bus in the reverse direction for each third signal sent on the bus, so the real bus capacity in packets per second is (1.33 x number of signals) per second.

The maximum MasterBus 300 capacity, however, is 2000 signals per second. Please note also that the MasterBus 300 bus capacity and response time presented above assume that the IEEE 802.3 bus is used exclusively by MasterBus 300. If, for example, the bus is also used for ABB SuperView communication, MasterBus 300 performance is reduced.

A message is segmented into packets by the transport service if the message exceeds 256 bytes. In an Advant OCS system, therefore, only some MasterView display updates are segmented and the average bus load from a message sent each second is approximately 0.07%. The bus load from a Data Set sent each second is 0.056%.

Routing between MasterBus 300 buses, or transit of messages between MasterBus 300 and MasterBus 200 or the ABB SuperView bus (GCOM), loads the DSPC 170 host processor in the intermediate MasterPiece 200/1 or MasterView 850/1 node as follows:

Table 4-2. DCPC 170 Load in an Intermediate Node

Intermediate node	**DSPC 170 load (ms/signal)**
MB 300 <-> MB 200	2.5 + 0.8 * N(1)
MB 300 <-> GCOM	2
MB 300 <-> MB 300	2 * q

(1) Where N = number of 112 byte segment
q=1 for signal size <= 256 bytes
q=2 for signal size > 256 bytes.

NOTE

Communication between MasterBus 300/300E buses must not exceed 100 signals per second in a DSPC 170 system.

Table 4-3. System Load in Advant Controller 410 CPU as End System

Protocol	**Signal size in bytes**	**AC 410 CPU load ms/signal**
MB 300/300E	64	3.9
	512	5.0

Table 4-4. System Load in Advant Controller 450 CPU as End System

Protocol	**Signal size in bytes**	**AC 450 CPU load, ms/signal**	
		SC510	**SC520**
MB 300/300E	64	2.1	0.54
	512	2.8	0.75

Table 4-5. System Load in Real-Time Accelerator Board PU510 CPU as End System

Protocol	**Signal size in bytes**	**PU510 CPU load, ms/signal**
MB 300/300E	64	2.7
	512	3.3

Table 4-6. System Load in Advant Controller 450 CPU as an Intermediate Station

Protocol	Signal size in bytes	AC 450 CPU load, ms/signal		
		SC510<->SC510	SC520<->SC520	one SC520
MB 300	64	2.1	1.0	0.03
	512	2.8	2.2	0.03
MB 300E	64	3.6	1.0	1.0
	512	5.7	2.2	2.2

Table 4-7. System Load in Real-Time Accelerator Board PU510 CPU as an Intermediate Station

Protocol	Signal size in bytes	PU 510 CPU load, ms/signal
MB 300	64	2.2
	512	3.7
MB 300E	64	4.4
	512	6.0

Table 4-8. System Load in Advant Controller 410 CPU as an Intermediate Station

Protocol	Signal size in bytes	AC 410 CPU load, ms/signal
MB 300	64	3.5
	512	5.8
MB 300E	64	6.5
	512	8.5

4.2.2 MasterBus 300 Extended Performance

4.2.2.1 Basic Load on Link

The formula for calculation of the basic load (bit/sec) on the link between the bridges follows.

Each node generates a basic load when no data traffic takes place (idle traffic). The formula is based on tree transport connections which are maintained and takes into account the cyclic acknowledgment for the transport layer as well as the sending of routing vectors.

$$\mathbf{8}\left(\frac{\mathbf{234}}{\mathbf{rl}}+\left(\frac{\mathbf{64}}{\mathbf{tl}}\right)\times\mathbf{3}\right)\times\mathbf{n}$$

Please add 5% to the calculated value. Where:

rl is the cycle, by default 1 sec, for generating routing vectors sent on the network. It is specified in the NL data base element, property OVERRIDE.

tl is the cycle for sending cyclic acknowledge on the transport layer, the default cycle is once every 6 sec. It is specified in the TU data base element, property IDLET.

n is the number of nodes connected to the MB 300E bus.

4.2.2.2 Load from Data Sets

Sending one Data Set gives the following load (bit/sec) on the network:

$$\frac{(\mathbf{8}(\mathbf{nDAT}\times\mathbf{4}+\mathbf{49}))}{(\mathbf{scf}\times\mathbf{Bct})}$$

Where:

nDAT is the number of DATs in the Data Set.

scf is the scanfactor for the Data Set.

Bct is the basic cycle time for all Data Sets (default 0,5 sec).

4.2.2.3 Load Generated from Process Display

The formula for calculation of the load (bit/sec) on the link from a display follows. Perform these calculations for each MasterPiece from which the values are collected.

X1 = object type

Y1 = number of object in a node

Z1 = updating speed in seconds

:

:

Xn = object type

Yn = number of object in a node

Zn = updating rate in seconds

O1 = signals /second/node

O2 = bits/second(/node)Sn = max number of references/signal identity

DI/DO = 38

AI/AO = 23

SEQ = 8

PIDCON or RATIOSTN = 4

MANSTN = 7

GENOBJ = 9

DAT = 35

MMCX = 5

An = number of bytes/object

DI/DO = 10

AI/AO = 16

SEQ = 44

PIDCON = 92

PIDCONA = 148

RATIOSTN = 90

MANSTN = 48

GENOBJ = 40

DAT = 12

MMCX = 76

O1 = ((Y1 / S1) + 1) / Z1 + ... + ((Yn / Sn) + 1) / Zn

O2 = 8,8 x (O1 x 40 + Y1 x A1 / Z1 + ... Yn x An / Zn)

4.2.2.4 Load Generated from Process Display Exchange

The formula for calculation of the load on the link follows:

X1 = object type

Y1 = number of object

:

:

Xn = object type

Yn = number of object

O1 = number of signals

O2 = number of bits

Sn = max number of references/signal identity

DI/DO = 5

AI = 3

AO = 4

SEQ = 3

PIDCON = 1

RATIOSTN = 1

MANSTN = 1

GENOBJ = 2

GENUSD = 2

GENBIN = 2

GENCON = 2

DAT = 16

MMCX =1

An = number of bytes / object

DI/DO = 66

AI = 106

AO = 92

SEQ =104

PIDCON = 348

RATIOSTN = 224

MANSTN = 216

GENOBJ = 158

GENUSD = 158

GENBIN = 158

GENCON = 158

DAT = 24

MMCX = 370

O1 = ((Y1 / S1) + 1)+ . . . . + ((Yn / Sn) + 1)

O2 = 8 x (O1 x 40 + Y1 x A1 + ... Yn x An)

4.2.2.5 Load Generated from Events

The formula for calculation of the load on the link follows:

X1 = number of events / second

Y1 = number of alarms / second

O1 = number of signals / second

O2 = bits / second

O1 = X1 + Y1

O2 = (X1 + Y1) x 1260.

4.2.3 Capacity and Performance for GCOM in Advant Controller 400 Series

Capaccity and performance for GCOM in Advant Controller 400 Series:

- **A maximum of 50 messages per second** can be transferred through one GCOM port.
- If bursts of signals are sent, a **maximum of three signals per 60 ms** can be transferred through one GCOM port.
- **A maximum of three signals ready for sending** to each node on the GCOM bus can be queued on the GCOM board.
- The GCOM communication board **delays a signal** between the Advant Controller and the external computer **with a maximum of 20 ms**.

If the external GCOM node does not send an acknowledge for the transmitted signal within 250 ms, the GCOM handler retransmits the signal. During this acknowledge time-out, new signals ready for sending to the same node on the GCOM bus are queued up on the GCOM board.

Example of messages:

- One data subscription request to one node, requesting 1-16 objects.
- An answer on a request from one node which can contain of 1-38 objects depending on the object type and access type.
  Example:
  - Up to 38 objects for cyclic update of DI or DO.
  - Up to five objects for event update of DI or DO.
  - Up to 23 objects for cyclic update of AI or AO.
  - Up to three objects for event update of AI.
  - Up to two objects for cyclic update of PIDCON.
  - One object for demand update of PIDCON with access type 3.
- One Data Set (with up to 24 values (a value can be one integer, one real or 32 Boolean)).
- One order for one object.
- An answer on data subscription request for historical time tagged data (TTD) consists of up to seven messages with a total of up to 402 values.

If the external computer uses only the Data Set function, it can send/receive a maximum of 24*50 = 1200 values per second (1200 (integer/real) or 38400 (Boolean) object values).

If the external computer uses only the function "data subscription" and all values are logged and stored as historical time tagged data in the MasterPiece, then the external computer can request for 402 values in one TTD request. The answer is received in seven messages. The external computer then receives the maximum:

(50/(7 +1))*402 = 2500 values per second.

4.3 Application Start-up

Not applicable.

4.4 Tutorial

Not applicable.

4.5 Application Procedures

Not applicable.

4.6 Configuration/Application Building Menus

Not applicable.

Chapter 5 Runtime Operation

5.1 Product Operation

A computer network is an assembly of two or more computers connected to each other via communication links. The computers are called nodes or stations in the network. The communicating links can be of varying types and do not necessarily provide direct physical connections between all pairs of nodes.

It is often not necessary for each node to be aware of the existence of all other nodes in the same network. The network may, therefore, have different descriptions in different nodes, each description defining the nodes that are "visible" from one particular node. The total network is the union of all these sub-networks.

Since not all nodes are directly connected to each other, messages may have to pass through several intermediate nodes on their way from a source node to a destination node. The procedure of selecting a path through the network is called routing.

5.2 Operating Overview

Not applicable.

5.3 Runtime Tutorial

Not applicable.

5.4 Operating Instructions

Not applicable.

5.5 Runtime Operation Menus

Not applicable.

Chapter 6 Maintenance

6.1 Network Management Services for MasterBus 300/300E

6.1.1 General

This chapter describes the ABB MasterNet management services and system messages.

System messages report errors discovered by the system. System messages are produced when an error occurs. They present the type of error, where the error occurred and, in many cases, additional information to indicate what caused the error.

ABB MasterNet management services are implemented to assist system installers and users in handling issues and problems concerning internode communications. These services are divided into two groups of services, referred to as LAYMAN and EXPERT services.

The MasterNet management services are implemented in the following Advant OCS stations:

- MasterPiece 200/1
- MasterView 800/1
- MasterGate 230/1.
- Advant Station 500 series
- Advant Controller 410
- Advant Controller 450.

EXPERT services are those which require a deep understanding of the MasterNet communication system. Even if most of the EXPERT services can be used by all users, interpretation of the result requires deep understanding of the implementation. Operational management and fault management are EXPERT services.

The opposite of EXPERT services, LAYMAN services can be used by all users as a rational tool for maintenance and troubleshooting. Only LAYMAN services are described in this manual. These services are available as a MasterAid 200 Software Package which you can order from ABB. This chapter of the manual is the LAYMAN service user's guide.

Please note that some of the services are relatively time-consuming, especially the statistical services. When they are activated, the system's performance is influenced.

The following list attempts to specify the Network Management (NM) services supported by the MasterAid 200 and Advant Station 100 ES series Software Package. Throughout the document, the commands are grouped under the categories listed below. Whenever the word "system" appears, the system referred to is the communication system, including the entire network.

LAYMAN services:

- System Monitoring (partly)
- Statistics Operations
- System Monitoring
- Network Probing
- Status
- Show Default
- Service Version
- Communication System Guide
- Help.

EXPERT services include LAYMAN and:

- Operational Management
- Fault Management.

The Network Management Commands constitute a three-level hierarchical concept with the following levels: System level, NM level and Service level.

6.1.1.1 System Level

In addition to the “select network management” command, which invokes the NM level and is the only NM-command supported at the system level, you can also access all other general MasterAid 200 commands. Help commands issued provide information about all available commands.

Selecting Network Management

From the system level, invoke the NM level using the “select network management” command.

Command syntax: **SELNM**

Parameter description: No parameters.

6.1.1.2 NM Level

At the NM level, you can select any NM service. Help commands at this level provide information about supported Network Management Commands. This level is identified by the prompter: “NM>”.

Entering Service Level

Parameters for the "enter service level" commands are "target" and "peer", but you do not have to specify these parameters since they can be either defaulted (already specified by a previous call) or specified at the service level. However, information services (services that do not address a specific target) do not notice these parameters.

Command syntax: **cmd [target][,peer]**

Parameter description:

- **target_network:target_node[:target_slave];**

  Network and node number on which to perform the service. Enter the network number first followed by a colon (:), which serves as separator, and the node number. Define the slave processor number (1-16) if more than one slave processor associates with the target network number.

- **peer_network:peer_node[:peer_slave];**

  Network and node number for the target node's contracting party, i.e., the node with which it communicates. Enter this address in the same manner as the target address. Define the slave processor number (1-16) if more than one slave processor associates with the peer network number.

For some commands, this parameter is an optional way to specify at "what" the command should direct its attention. For example, with loop back test in Network Probing service level, the "target" node specifies where the transfer originates from, and the "peer" node specifies where the transfer is mirrored back.

The figure below, Figure 6-1, attempts to depict the relationship between the different nodes of interest for NM. A MasterAid 200 is attached to a machine, referred to as the local node. The target node is a node in the network at which the interest is directed, and the peer node is the target node's interlocutor for a particular communicational exchange.

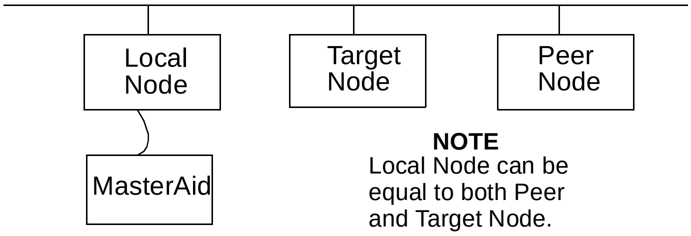


Figure 6-1. Local, Target and Peer Node

Show Defaulted Parameters

The specification of parameters for one particular command also makes those parameters valid for all other NM Commands. For example, you do not have to respecify the target node address each time a new command is requested since the last one given is always taken as the default value.

6.1.1.3 Service Level

To select other services, you must reselect the NM-level by leaving the current service level. Help requests respond to the current service level only.

Service Execution

When you enter the service level, a unique prompter (depending on the service type) is displayed. The prompter consists of "NM-" followed by the service abbreviation and ">". For example, executing the statistic command gives:

```
NM> STA 2:3,2:5
NM-STA>
```

As you can see in the example above, the bold characters are those entered by the user and the italicized characters are the system's responses. This standard of representation is followed throughout the document.

Set Parameters:

While at the service level, you can reset the "target", "peer" and "time out" parameters at any time without leaving the current service level.

Command syntax: **SET par_id=value**

Parameter description:

par_id	Type of parameter to set. May be target, peer and time out, defined as follows:
TA	Target—network, node and slave number on which to perform the service (for more information, see Section , NM Level).
PE	Peer—network, node and slave number for the "peer" node (for more information, see Section , NM Level).
TO	Time Out for network management service. The NM provider must respond within this time or else the operation is considered failed.
HC	Hardcopy. This command can be used to route data from MasterAid screen to the printer connected to it.
value	New value for the parameter defined by par_id. The value consists of one or two parts, depending on parameter to set. Specified in the following manner:

- TA=network:node[:slave] target is set to new network, node and slave number.
- PE=network:node[:slave] peer is set to new network, node and slave number.
- TO=elapse_time time out is set to new value, where elapse time is given in seconds.
- HC=on/off start/stop copying data to printer.

Show Parameter:

Check parameters defined for the NM service operation, such as "target", "peer", and other service-specific parameters, for their currently assigned values using this command. You can issue the command at any level within NM.

Command syntax: **SHO**

Parameter description: No parameters

Exit Current Level

To leave the current level and go up in the hierarchy, use the exit command "EXIT" or "X".

You can give this command at both the service level and at the NM-level. If you give this command at service level, it changes the current level to NM level and, likewise, if you give it at the NM level, it changes the current level to system level.

Parameter Dialogue

Instead of specifying parameters immediately when you give the command, you can enter the parameters in a dialogue manner, which allows you to give one missing parameter at a time. Once you specify the parameters, however, these values become the default values and no dialogue is initiated.

You can enter the dialogue mode even if all the parameters should have been given earlier. If the you follow the command with a question mark ("?"), the dialogue that prompts for all the parameters for that particular command is started. You can terminate initiated dialogues, and the command itself, by entering an exclamation sign ("!") as a response to the prompter.

Help

The HELP Command:

You can enter the help command at any level of NM. You can give the command with or without a parameter.

Command syntax: **HELP [keyword]**

Parameter description:

keyword	what to inform about (if omitted, current command level). Valid keywords are:

All **NM** commands.

COMMANDS	lists all NM commands.
KEYWORDS	lists all valid keywords that are not NM commands.
ALL	lists all valid keywords, i.e. = **HELP COMMANDS + HELP KEYWORDS**.
TARGET	describes the parameter target.
PEER	describes the parameter peer.
STRUCID	describes the parameter strc_id.
CTRLPNT	describes control point handling.

DIALOGUE describes the possibility to enter parameters in dialogue mode.

If you do not give a parameter, then a help text describing the current level and all valid commands is presented.

Dialogue help:

Help can also be provided for any parameter in dialogue mode. You can obtain information about a parameter by entering a question mark (?). A brief description about the expected parameter is provided. Since you can force dialogue mode for any NM command, help can be provided for all parameters for all commands in this fashion. You do not even have to know the parameter names.

Specification and Identification of Entities

In an interconnected communication system, the node on which the requested action is performed is specified by network number and node number and referred to as the target node. Moreover, many operations can be directed at entities within that particular node. To identify an entity, the network number and node number of the node with which the target node communicates may suffice for identification. Some other structures or entities cannot be identified in this way and you must provide a number or a symbolic name. This may also be more convenient.

For example:

```
*
* SELNM
NM>MON 1:2,1:3
NM_MON>DENS
NM_MON>
```

If the operator specifies the peer node, as in the “list destination node status” example above, where the peer is set to network 1, node 3, and target to network 1, node 2, and the peer is a neighbor node, it is unnecessary for the operator to do additional structure identity specification. The NM service knows which data link structure is associated with this node and the communication to it.

Presentation

Returned information is presented one screen page at a time. Between each page, you can decide whether to continue displaying or not by responding to the prompt:

```
More? (Y/N)
```

Hang On Message

Since remote operations do require time to complete, an operator could easily be stressed by a situation where he has to sit back not knowing whether the system is working or not. The NM gives a message to inform the operator that the operation is proceeding when a substantial time has elapsed.

The message is **Hang on, still working**

NOTE

This message is only displayed in exceptional cases.

6.1.1.4 Error Responses

In addition to normal command error responses to incorrectly specified parameters, command syntax errors, etc., regarding both the command decoder of the command and the internal checks when in dialogue mode, the NM must, and does, respond to other operational errors and problems.

The responses are as follows:

- Network number not defined
- Node number not defined
- Node unreachable
- Operation not accepted
- Illegal specification
- Operation failed.

6.1.2 System Monitoring

Enter the monitor mode using the command MON. The services found under this heading involve monitoring the status for all destination nodes within the target control network, seen from the target node. These services, which do not address a specific destination node, do not notice the “peer” parameter.

Command syntax: **MON [target][,peer]**

Parameter description:

target	target_network:target_node. Refer to general description, Section , NM Level.
peer	peer_network:peer_node. Refer to general description, Section , NM Level.

6.1.2.1 List Destination Node Status

This command displays the status for all destination nodes within the target control network, seen from the target node.

Command: **DENS**

Parameter description:No parameters.

Information presented:

netw:node	destination's network number and node number;
status	communication status between target and destination nodes, which can obtain one of the following:

	ACTIVE destination node is reachable from target node.
	INACTIVE destination node is currently not reachable from target node.
	NOTDEF destination node does not exist or no link has been defined to that node from target node.
subntyp	subnet type of network.
dist	distance between target and destination in number of hops.

6.1.3 Statistics Operation

You can direct statistics to either the buffer manager, performing statistics operations concerning the buffer usage, or the communication system, which primarily concerns the traffic and measuring the stabilizing time for topology changes.

Statistics operations require time to measure accurately. When you initiate a statistics collection, specify the amount time over which it is to be measured—the duration time. While the measurement is proceeding, you can simultaneously request and perform other NM-activities. To check other ongoing activities, use the PND (show pending operations) command.

Once you have started the statistics operation, no other activate statistics commands for that particular type of statistics and node are accepted, unless you explicitly stop it (by a terminate command) or the measurement is finished and the result is read.

Command syntax: **STA [target][,peer]**

Parameter description:

target	target_network:target_node. Refer to general description, Section , NM Level.
peer	peer_network:peer_node. Refer to general description, Section , NM Level.

6.1.3.1 Activate Buffer Manager Statistics Measurement

This service starts MasterNet Buffer Manager (BM) statistics activities on the specified target node. Call it prior to reading any BM statistics.

Calling the service results in resetting statistics counters and initiating the measurement.
The measurement is performed during the specified time interval and the statistics can be read when it is finished, or whenever you wish.

This service is only available for a full architecture network (MasterBus 300/300E).

Command syntax:

ABUF duration[,pool][,strt_time][,strt_date]

Parameter description:

duration	The time duration for the measurement in seconds [1 to 9999];
pool	Specified as:
	1. buffer pool number, [1-max_number]

	2.ALL; if measurement of all pools wanted
	3. If omitted, the buffer pool number may be derived from the "peer" parameter (not yet implemented)
strt_time	Start time, in time-of-day format, for the measurement: hh:mm:ss, [00:00:00 - 23:59:59] (If omitted, the operation is immediately started.)
strt_date	Start day for the measurement: yy-mm-dd, [current_date - current_date+2] (If omitted, set to the current day, or the following day if the time given for the start time has already passed.)

NOTE

NM checks that the specified combination of starting date and time is in the future. There is also a check that the specified starting time is not TOO MUCH in the future. The starting date must not be more than two days ahead. If the starting date is two days ahead, then the starting time must not be more than the current time + 10 hours. This means that after 2 p.m., the maximum delay decreases until midnight. It reaches a minimum delay of exactly two days. After midnight, the maximum delay is again two days and 10 hours until 2 p.m.

6.1.3.2 Terminate BM Statistics Measurement

This service immediately stops all buffer manager statistics measurement, and the collected statistics are lost.

Command syntax: **TBUF**

Parameter description: No parameters.

6.1.3.3 Read BM Statistics

This service returns statistics about the buffer pool usage. Once the BM statistics collection is initiated, you can read the statistics at any time to see the present values. This is a way of obtaining lap results from the measurement.

Upon completion of the measurement, a read request presents the final result and the request is removed from the list of current processed operations. The collected statistics can, however, still be read until a new activate or terminate request is issued.

Command syntax: **RBUF [pool]**

Parameter description:

pool	specified as:
	1.buffer pool number
	2.ALL; if statistics from all pools wanted
	3.If omitted, the buffer pool number may be derived from the "peer" parameter (not yet implemented)

The information from a successful call contains the following:

- The mean number of free buffer blocks over the time interval of this measurement
- Number of failed buffer allocations in each buffer class respectively
- Number of stolen buffers in each class
- Number of times the buffer pool has become 100 percent full.

6.1.3.4 Activate Traffic Statistics Measurement

This service starts all traffic statistics on the target node at a specified time and continues until you explicitly stop it or the duration time expires.

Command syntax: **ATRA stat_id,duration[,node_id][,strt_time][,strt_date]**

Parameter description:

stat_id	The kind of statistical measurement to perform. May be single statistical item, chosen set of items or all items. Refer to list further on.
duration	The time duration for the measurement, [1 -9999] seconds.
nodeid	Collected statistics for the traffic to these nodes are read. May be: 1. Single node, [1:1-netw_n:node_n] 2. Previously defined set of nodes by DNOD 3. ALL; All nodes; 4. If omitted, then the node may be derived from the peer parameter.
strt_time	Start time, in time of day format, for the measurement: hh:mm:ss, [00:00:00 - 23:59:59] (If omitted, the operation is started immediately.)
strt_date	Start day for the measurement: yy-mm-dd, [current_date - 99-12-31] (If omitted, the current day, or the following day if the time given for the start time has already passed.)

NOTE

NM checks that the specified combination of starting date and time is in the future. There is also a check that the specified starting time is not TOO MUCH in the future. The starting date must not be more than two days ahead. If the starting date is two days ahead, then the starting time must not be more than the current time + 10 hours. This means that after 2 p.m., the maximum delay decreases until midnight. It reaches a minimum delay of exactly two days. After midnight, the maximum delay is again two days and 10 hours until 2 p.m.

6.1.3.5 Define Traffic Statistics

There are many different statistics to choose from. The Network Management entity in the target node cannot fully meet the demands of allocating needed resources to collect all available statistics when the number of peer nodes (nodes with which the target communicates) increases.

This command allows you to define your own set of statistics to collect, selecting from the available statistics items.

Command syntax: **DTRA setid**

Parameter description:

setid	Name of statistics set.

User-specified identity for the statistics set which may later be used in the ATRA command. The identity can be any string of a maximum of four characters, [A - 9999].

6.1.3.6 Command Prompting

When you invoke this service, having already defined the statistics set, it first displays what this set consists of before entering the update mode. If any of the system-defined set is given, the set of items is listed but no change of the content is permitted.

To specify the set, the command enters update mode, where you are prompted to enter new items or remove items from the list, even the entire set. The following syntax is defined:

+ item	add item (the “+” can be omitted)
- item	delete item already in the list
- -	delete entire set
!	terminates the command.

Example:

```
NM-STA>DTRA LISA
    Set = LISA
        SS_EMERG
        SS_HIGH
        SS_NORMAL
    Enter: SS_LOW
    Enter: - SS_NORMAL
    Enter: <CR>
    Enter: !
    NM-STA>
```

6.1.3.7 Statistics Items

The following list specifies the statistics items available to collect, to use either directly when you give the ATRA command or when you are building up a unique set of statistics with the DTRA command. Predefined sets contain combinations of these items.

Items whose specification are marked with an “f” are valid for a full architecture network (MasterBus 300/300E) whereas items marked with a “c” are valid for a collapsed architecture network (MasterBus 200). When both types are valid, the specification “cf” is used.

Table 6-1. Host Counters

Counter	Validity	Comments
SS_EMERG	f	Number of signals sent on emergency priority
SS_HIGH	f	Number of signals sent on high priority
SS_NORMAL	c, f	Number of signals sent on normal priority
SS_LOW	f	Number of signals sent on low priority
SR_EMERG	f	Number of signals received on emergency priority
SR_HIGH	f	Number of signals received on high priority
SR_NORMAL	c, f	Number of signals received on normal priority
SR_LOW	f	Number of signals received on low priority
SD_EMERG	f	Number of received signals dropped on emergency priority (channel overflow)
SD_HIGH	f	Number of received signals dropped on high priority (channel overflow)
SD_NORMAL	c, f	Number of received signals dropped on normal priority (channel overflow)
SD_LOW	f	Number of received signals dropped on low priority (channel overflow)
TRANST_SGL	c, f	Number of signals in transit
SENT_TPDU	f	Number of tpdu's (transport protocol data units) sent
RECD_TPDU	f	Number of tpdu's received
RE_XMIT_TP	f	Number of tpdu's re-transmitted
TL_IBCR	f	Number of connection request tpdu's received
TL_OBCR	f	Number of connection request tpdu's sent
TL_IBCC	f	Number of connection confirm tpdu's received
TL_OBCC	f	Number of connection confirm tpdu's sent
TL_IDR	f	Number of disconnect request tpdu's received
TL_ODR	f	Number of disconnect request tpdu's sent
TL_IDC	f	Number of disconnect confirm tpdu's received
TL_ODC	f	Number of disconnect confirm tpdu's sent
LRTLIDR	f	Last disconnect reason for received disconnect request tpdu's

Table 6-1. Host Counters (Continued)

Counter	Validity	Comments
LRTODR	f	Last disconnect reason for sent disconnect request tpdu's
TDLE_TIMER	f	Number of times the transport idle timer has expired
TCRI_TIMER	f	Number of times the transport connection request timer has expired for the initiator
TCRA_TIMER	f	Number of times the transport connection request timer has expired for the acceptor
TDR_TIMER	f	Number of times the transport disconnect request timer has expired
TREA_TIMER	f	Number of times the transport tpdu re-assembly timer has expired
TCRS_TIMER	f	Number of times the transport credit sender timer has expired
TCRR_TIMER	f	Number of times the transport credit receiver timer has expired

Table 6-2. Subnet Counters

Counter	Validity	Comments
SENT_ROUTV	f	Number of routing vectors sent
RECD_ROUTV	f	Number of routing vectors received
RECD_DLPDU	c, f	Number of data link pdu's (dlpdu) successfully received
SENT_DLPDU	c, f	Number of s data link pdu's successfully sent
FLDPDU	c	Number of failed dlpdu's received due to checksum error
SEQ_ERRORS	c	Number of sequence errors
OVERFLOW	c	Number of overflows on destination channel (DSX)
MAC_FRAM	f	Number of MAC pdu's lost due to framing error
MAC_UFLO	f	Number of MAC pdu's lost due to SILO underflow, i.e., the handler was not able to queue buffers to LANCE/ILACC quickly enough
MAC_CRC	f	Number of MAC pdu's lost due to checksum error
MAC_BUFO	f	Number of MAC pdu's lost due to buffer error (implies OFLO)
MAC_ONE	f	Number of MAC pdu's which required one retry to be sent

Table 6-2. Subnet Counters (Continued)

Counter	Validity	Comments
MAC_MORE	f	Number of MAC pdu's which required more than one retry to be sent
MAC_DEF	f	Number of MAC pdu's temporarily deferred due to busy channel
MAC_LCOL	f	Number of MAC pdu's not sent due to late collision
MAC_LCAR	f	Number of MAC pdu's not sent due to loss of carrier
MAC_RTRY	f	Number of MAC pdu's lost due to too many collisions on Ethernet medium
MAC_MISS	f	Number of MAC pdu's missed

6.1.3.8 Statistics Sets

When you specify the "what" parameter for the activate statistics command, the "what" may be either:

- A single statistics item;
- Any of the predefined "set" of statistics, following below; or
- A user-defined "set" of statistics, defined by the DTRA command.

The following predefined "sets" of statistics exist:

ALL	All statistics will be collected if possible.
HOST	Host counters are collected (SS_EMERG..TCRR-TIMER)
SUBN	Subnet counters are collected (SENT_ROUTV..MAC_MISS)
HEAL	Attempts to mirror the health of the target node, regarding the communication status (TDLE_TIMER..TCRR_TIMER) and (SENT_ROUTV..RECD_ROUTV)
DT	Data transfer statistics, for all layers (SS_EMERG..RE_XMIT_TP)
DCR	Disconnect reasons (LRTLIDR..LRTLODR)
ERR	Count all error and fail statistics (LRTLIDR..LRTLODR) and (FLDLPDU..OVERFLOW) and (MAC_FRAM..MAC_MISS)
CODI	Pdu's concerning connections and disconnections are counted (TL_IBCR..TL_ODC)
TU	Collect only transport user statistics (SS_EMERG..TRANST_SGL)
T	Collect only transport layer statistics (SENT_TPDU..TCRR_TIMER)
N	Collect only network layer statistics (SENT_ROUTV..RECD_ROUTV)
D	Collect only data link layer statistics (SENT_DLPDU..OVERFLOW)

6.1.3.9 Define Set of Nodes

Use this service to specify the parameter "nodes" to be used in the "ATRA" command. The "ATRA" command activates the statistics collection in the "target" node, but it cannot always provide the collection of all statistics for all connections because of the huge memory requirements. You must decide which nodes you are interested in, regarding the statistics of the "target" node's communication with each of the nodes specified by this command, respectively.

Command syntax: **DNOD node_id**

Parameter description:

node_id	User-specified identity for the node identity's set which may later be used in the ATRA command. The identity can be any string of a maximum of four characters, [A-9999].

6.1.3.10 Command Prompting

If the set given previously is defined, the command lists the content of the set first before it enters update mode. In the update mode, you are prompted for each node. An exclamation mark ("!") terminates the command, now with a new set of nodes. To specify the set, the command enters update mode, where you are prompted to enter new nodes or remove nodes from the list, even the entire set. The following syntax is defined:

+ node	add node (the "+" can be omitted)
- node	delete node already in the list
--	delete entire set
!	terminate command

Example:

```
NM-STA>DNOD ANNE
Set = ANNE
      2:2
      2:8
      2:3
Enter 3:11
Enter - 2:8
Enter <CR>
Enter !
NM-STA>
```

6.1.3.11 Terminate Traffic Statistics Measurement

This service immediately stops all traffic statistics activities, and the collected statistics are lost.

Command syntax**: TTRA**

Parameter description: No parameters.

6.1.3.12 Read Traffic Statistics

This service returns statistics about the communication traffic in the target node. The statistics can be read at any time to check the present state and result. They can be read continuously until the statistics stop as a result of duration expiration or are otherwise stopped or terminated.

Command syntax: **RTRA [node_id**]

Parameter description:

node_id	collected statistics for the traffic to these nodes are read May be: 1. Single node, [1:1 - netw_n:node_n] 2. Previously defined set of nodes by DNOD 3. ALL: all nodes 4. If omitted, then the node may be derived from the peer parameter.

6.1.3.13 Activate DL Queue Statistics Measurement

The data link queue statistics service facilitates measuring how well the communication system copes with the traffic flow and whether the data link handler receive and transmit queues are properly dimensioned with respect to traffic bursts and normal load conditions. The service also measures the data link user queues.

Please note, however, that the queues are not unique for each neighboring node since there is one receive queue and one transmit queue for each data link handler, and this handler may serve several “peers”. This service is only available for a full architecture network (MasterBus 300/300E).

Command syntax: **ADLQ duration[,dnetw][,strt_time][,strt_date]**

Parameter description:

duration	The time duration for the measurement, [1-9999] seconds
dnetw	Destination network numbers to start the data link queue measurement. If omitted, the network may be derived from the “peer” parameter. May be: 1. Single network, [1-netw_n] 2. Previously defined set of networks by DNET 3. ALL: all networks
strt_time	Start time, in time-of-day format, for the measurement: hh:mm:ss, [00:00:00-23:59:59] (If omitted, the operation is immediately started.)
strt_date	Start day for the measurement: yy-mm-dd, [current_date-current_date+2] (If omitted, set to the current day, or the following day if the time given for the start time has already passed.)

NOTE

NM checks that the specified combination of starting date and time is in the future. There is also a check that the specified starting time is not TOO MUCH in the future. The starting date must not be more than two days ahead. If the starting date is two days ahead, then the starting time must not be more than the current time + 10 hours. This means that after 2 p.m., the maximum delay decreases until midnight. It reaches a minimum delay of exactly two days. After midnight, the maximum delay is again two days and 10 hours until 2 p.m.

6.1.3.14 Define Set of Network

Use this service to specify the parameter "dnetw" to be used in the "ADLQ" command.

Decide which network you are interested in regarding the statistics of the "target" node's communication with each of the networks specified by this command, respectively.

Command syntax: **DNET dnetw**

Parameter description:

dnetw	User-specified identity for the network identity's set which may later be used in the ADLQ command. The identity can be any string of a maximum of four characters, [A -9999].

Command Prompting:

The command works identically to the DNOD command except that here you enter only the network number rather than specifying a network node number.

6.1.3.15 Terminate DL Queue Statistics Measurement

This service immediately stops all data link queue statistics measurement, and the collected statistics are lost.

Command syntax: **TDLQ**

Parameter description: No parameters.

6.1.3.16 Read DL Queue Statistics

This service returns statistics about the data link queue logging. You can call it any time after the measurement is initiated by an ADLQ call. It returns information about the data link receive and transmit queues for the specified device.

Command syntax: **RDLQ [dnetw]**

Parameter description:

dnetw	Collected statistics about the data link queues associated with the communication to these networks are read. May be: 1. Single network, [1-netw_n] 2. Previously defined set of networks by DNET 3. ALL: all networks

Returned information:

- Mean transmit queue size
- Mean receive queue size (empty buffers)
- Max transmit queue size
- Min receive queue size (empty buffers)
- Max data link user queue size
- Mean data link user queue size.

6.1.3.17 Activate Stat. Measurement for Back Pressure on Session Queues

This service measures the time for which the back pressure (please refer to Section 1.8.1.3, Layer 4) was active on session receive queues. It gives an indication of the load on the communication system users.

This service is only available for a full architecture network (MasterBus 300/300E).

Command syntax: **ABAP duration[,dnode_id][,strt_time][,strt_date]**

Parameter description:

duration	The time duration for the measurement, [1-9999] seconds.
dnode_id	Name of nodes set. Statistics are collected for the communication between the "target node" and each of the nodes specified by "node_id". All nodes may easily be specified by entering ALL. If omitted, only the "peer" node is measured.
strt_time	Start time, in time-of-day format, for the measurement: hh:mm:ss, [00:00:00-23:59:59] (If omitted, the operation is immediately started.)
strt_date	Start day, for the measurement: yy-mm-dd, [current_date - current_date+2] (If omitted, set to the current day, or the following day if the time given for the start time has already passed.)

NOTE

NM checks that the specified combination of starting date and time is in the future. There is also a check that the specified starting time is not TOO MUCH in the future. The starting date must not be more than two days ahead. If the starting date is two days ahead, then the starting time must not be more than the current time + 10 hours. This means that after 2 p.m., the maximum delay decreases until midnight. It reaches a minimum delay of exactly two days. After midnight, the maximum delay is again two days and 10 hours until 2 p.m.

6.1.3.18 Define Set of Nodes

You can use the DNOD command, used in the traffic statistics, to specify the "peer" nodes communicating with the "target" for which the back pressure statistics are to be collected.

6.1.3.19 Terminate Stat. Measurement for Back Pressure on Session Queues

This service immediately stops all back pressure on session queues statistics measurement, and the collected statistics are lost.

Command syntax: **TBAP**

No parameters.

6.1.3.20 Read Statistics for Back Pressure on Session Queues

This service returns statistics about the back pressure on session queues. You can call it at any time after the measurement is initiated by an ABAP call. It will return the time duration for which the back pressure was active on various session queues.

Command syntax: **RBAP [dnode_id]**

Parameter Description:

node_id Collected statistics for the back pressure to these nodes are read. It may be specified in any of the following ways:

1. Single node, [1:1-netw_n:node_n]
2. Previously defined set of nodes by DNOD
3. ALL - all nodes
4. If omitted, then the node may be derived from the peer parameter.

The following information is presented for each peer node:

```
netw:node = x:y elapsed time = hh:mm:ss

priority     emergency      highnormal    low

max time receive queue zzzzzzzz zzzz    zzzz

mean time receive queuezzzzzzzz zzzz   zzzz

number of times back-

pressure was activennnn   nnnnnnnn      nnnn
```

where the first zzzz entry can be interpreted as:

> The maximum time in milliseconds for which the back pressure was active on session receive queue with emergency priority.

Elapsed time is the time period for which the statistics measurement has been done.

6.1.3.21 Activate Network Stabilization Measurement

Modifications of the network topology are dynamically handled by the network itself, so the network always has an up-to-date picture of how to route through the network and which nodes the network contains. New links and nodes, as well as their failure, causes the network to be flooded with messages of events that occur. The stabilizing time is measured as the time elapsed between the first reception of such a message until these messages cease and the network is again stable.

This command activates a statistical measurement (from the target node's point of view) of the network's stabilizing time at topology modifications.

This service is only available for a full architecture network (MasterBus 300/300E).

Command syntax: **ATOS duration[,strt_time][,strt_date]**

Parameter description:

duration	The time duration for the measurement, [1-9999] seconds.
strt_time	Start time, in time-of-day format, for the measurement hh:mm:ss, [00:00:00-23:59:59] (If omitted, the operation is immediately started.)
strt_date	Start day, for the measurement: yy-mm-dd, [current_date-99-12-31] (If omitted, set to the current day, or the following day if the time given for the start time has already passed.)

NOTE

NM checks that the specified combination of starting date and time is in the future. There is also a check that the specified starting time is not TOO MUCH in the future. The starting date must not be more than two days ahead. If the starting date is two days ahead, then the starting time must not be more than the current time + 10 hours. This means that after 2 p.m., the maximum delay decreases until midnight. It reaches a minimum delay of exactly two days. After midnight, the maximum delay is again two days and 10 hours until 2 p.m.

6.1.3.22 Terminate Network Stabilization Measurement

This service immediately stops the measurement of the network stabilization time, and the collected statistics are lost.

Command syntax: **TTOS**

No parameters.

6.1.3.23 Read Network Stabilization Measurement

This service returns statistics about the stabilization time required for network topology modifications. You can call the service any time after the measurement is initiated by an ATOS call.

Command syntax: **RTOS**

No parameters.

Returned information:

Stabilization time at init

Minimum stabilization time

Mean stabilization time

Maximum stabilization time.

6.1.3.24 Clear Statistics Activities

This service clears the statistics log buffer and all ongoing statistics.

Please note that EVERYTHING, including user-defined sets, is lost. Also, statistics operations directed at targets other than the current target are lost.

Command syntax: **CLES**

No parameters.

6.1.4 Network Probing

The network probing services test the communication software and the physical paths by initiating transfer of data between two nodes situated anywhere in the interconnected networks. The transfer is performed between two tasks using normal internode task communication facilities, which means that loop-backs are only supported for end-to-end application level tests.

Command syntax: **PRO [target][,peer]**

Parameter description:

target	target_network:target_node. Executor node of the loop-back test, from which the messages will be sent, [1:1 - network_n:node_n]. Refer to general description, Section , NM Level.
peer	peer_network:peer_node. The node which serves as the receiver of the sent messages and which will return the messages to the originating node, back to the target node, [1:1 - network_n:node_n]. Refer to general description, Section , NM Level.

6.1.4.1 Loopback Test

The two nodes, the target node from which the transfer originates, and the peer node from which the transfer is mirrored back, perform a time-stamping indicating when the data is sent and when it is received. They also check the data integrity (has the data been corrupted anywhere in the transfer?). Finally, the result is sent back to the user's node from which the request was issued and the NM presents the result.

If no parameters are given when this service is called, a simple check of whether the communication is in working order between these two nodes is performed. All parameters can be omitted, but it is required that the target and peer node already be specified.

Command syntax: **LOOP [number][,length][,messtyp] [,priority]**

Parameter description:

number	Number of message packets to be sent in the loopback test, [1 - 127]. If omitted, number of messages will be one (1).

length	Number of bytes in message packet, [1 - 512]. This parameter should not be specified less than 13 bytes, which is the size of the DSX header (12) plus 1 byte. If omitted, number of bytes is set to a predefined value (256).
messtyp	Type of message used for the test: 0, zeros; 1, ones; X, mixed zeros and ones; If omitted, message type will be mixed (X).
priority	Priority of the message 0 = low 1 = normal 2 = high 3 = emergency If omitted, priority will be normal.

Operational Results

If the loopback test is successfully completed, the following results of the service are given:

- No. of messages sent;
- No. of messages received;
- No. of erroneous messages received;
- Mean time, in milliseconds, taken for the loopback;
- Maximum time, in milliseconds, taken for the loopback;
- Minimum time, in milliseconds, taken for the loopback.

6.1.5 NM Activity Status

This service concerns currently processed NM activities and their status. You can initiate operations that are not immediately completed and require a certain amount of time to finish. Concurrently to their processing, you can issue other operations and need not be concerned with watching for the previous operations' results. Upon completion of an operation, the NM receives a message about the operation's completion. The NM saves this status and allows you to check for it.

The Network Management command to check out the status of pending NM activities is PND (show pending operations' status). You can give the PND command either at the NM-level or at the NM-STA level.

Command syntax: **PND**

No parameters.

A list of the operations currently processed is presented containing the following information for each operation, respectively:

service status target peer entity time

where:

service	service call, e.g, ABUF.
status	current status of operation, which may be: Running or Completed.
target	target network and node number (the particular node to which the request was issued).
peer	peer network and node number (refer to general description, Section , NM Level for more information on the concept of peer).
entity	what the statistics are directed at: e.g., device, pool, etc.
time	time when completion of operation is expected.

6.1.6 Show NM Parameters

The parameters specified by the NM user in previous service calls, which become the default for the NM, are viewed when you call this service. The service also shows the target’s date and time in order to aid in setting up operations correctly.

Command syntax: **SHO**

No parameters.

Information about the currently assigned parameters is presented:

- Target;
- Peer;
- Time-out time;
- Hardcopy;
- Node sets;
- Statistics sets;
- Control points;
- Target’s date;
- Target’s time.

6.1.6.1 Service Level Call

You can call this service level while at any other service level.

Command syntax: **SHO**

No parameters.

6.1.7 NM Service Version

The Network Management Commands allow various kinds of operations featuring some services which might be difficult, if not unsuitable, for inexperienced users. For this reason, NM is available in several versions. Some restrict the facilities supported to LAYMAN services, and others permit operations which may require extensive knowledge of the communication system's design and performance.

The service also checks the consistency between itself and the target node's system and checks if the MasterBase SW version corresponds to the version assumed by the NM.

This service informs you of which Network Management service version you are running and the services available.

Command syntax: **VER [target**]

Parameter description:

target target_network:target_node. Refer to general description, Section , NM Level.

Presented Information:

Software: MasterBase SW*X.Y/Z

Supported services: xxxx

NM Consistency: YES/NO

The presented information, above, attempts to mirror the software version on the target node and its current status. The information is interpreted in the following manner:

Software:

X = major release;

Y = minor release;

Z = revision;

xxxx = EXPERT or LAYMAN.

NM Consistency: **YES**; when NM regards that the correspondence between the target node's software and itself is sufficient for proper service, when the major releases conform.

When minor releases do not conform, some services can be run properly.

NO; when NM does not guarantee the operational results because of software version mismatch, when the major releases do not match.

LAYMAN services are:

VER

GUI

SHO

PND

MON

- STA
- PRO
- HELP

EXPERT services include LAYMAN and:

- FLT
- MON
- OPR.

6.2 Hardware Indicators

6.2.1 DSCS 140/145 Hardware Indicators

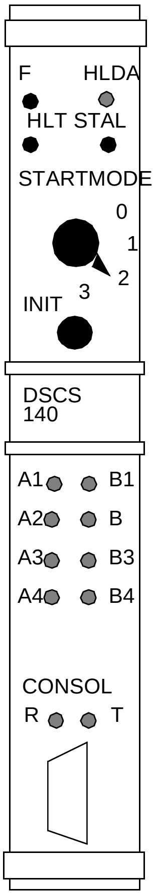


Figure 6-2. Front Panel DSCS 140/145

Table 6-3. Front Panel LED's on DSCS 140/145

Name	Defining	LED color
F	Fault	Red
HLDA	DMA access	Yellow
HLT	Halt	Red
STAL	Stall	Red
A1	Receive from network	Yellow
B1	Transmit to network	Yellow
A2 - B2	Not used	-
B2 - B4	Not used	-
R	Receive in OFFLINE mode	Yellow
T	Transmit in OFFLINE mode	Yellow

If the F (Fault) LED is constant lit, then please check network and node setting on rotary switches.

If the F (Fault) LED is slowly switched on and off constantly, then check connection to transceiver and that the transceiver is trapped for Heartbeat (SQE).

6.2.2 CS513 Hardware Indicators

CS513 is a small circuit board adapted to the Module Interconnection Bus (MIB) and intended for insertion in various processor boards such as Advant Controller 410, SC 510 and SC 520. The board contains an Integrated Local Area Communication Controller which realizes the physical level of communication defined in the standard IEEE 802.3.

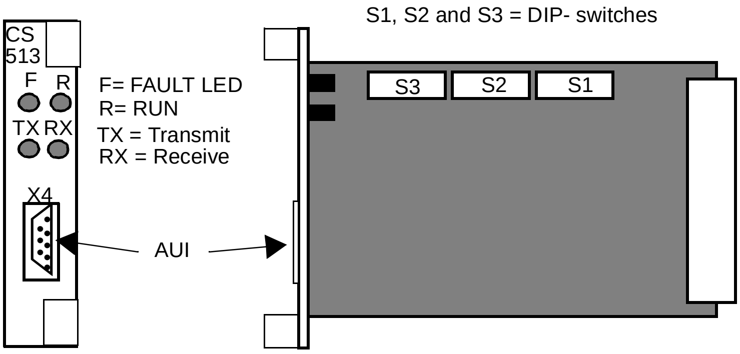


Figure 6-3. CS513 Small Circuit Board adapted to the Module Interconnection Bus (MIB)

Table 6-4. CS513 LEDs

Name	Defining	LED color
F	Fault	Red
R	Run	Green
TX/LAN	Transmit to LAN	Yellow
RX	Receive from LAN	Yellow

If the F LED and the R LED are slowly turned on and off alternatively, then check connection to transceiver and that the transceiver Heartbeat (SQE Test) is switched on.

6.2.3 SC5X0 Hardware Indicators

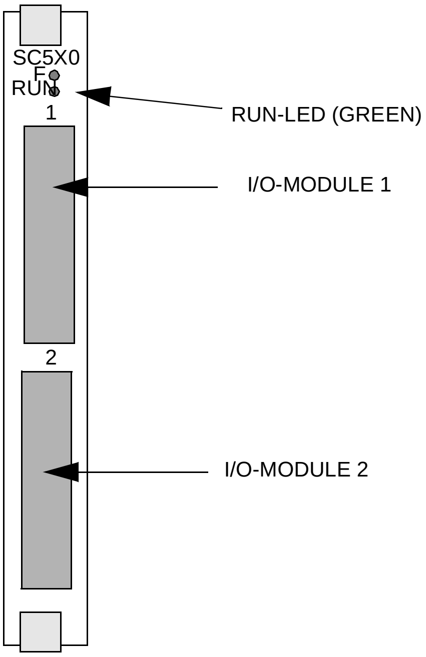


Figure 6-4. SC5X0

Table 6-5. SC5X0 LEDs

Name	**Defining**	**LED color**
F	Fault	Red
RUN	Run	Green

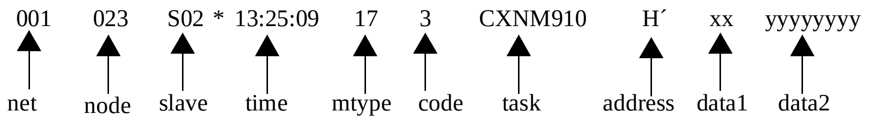
6.3 Error Messages

6.3.1 General

System messages report errors and similar events discovered by the MasterPiece 200/1, MasterView 800/1, Advant Station 500 series, Advant Controller 400 series or MasterGate 230/1 stations. They give information on the type of error, where the error occurred and, in many cases, also provide additional diagnostic information to indicate what caused the error.

MasterNet is thoroughly tested and is believed to be correct and reliable. However, in rare cases system halts or system messages may be caused by an error in the system software. Such error codes and system messages are described in this manual with the text: "Reason: internal error (please report to ABB Automation AB)".

A system message can be printed out by the station that generated it, it can be transferred via MasterNet and printed out by another station, or it can be displayed on a service aid. Each system message contains the network and node identities of the station in which it was generated. System message printouts have the following appearance:



Mtype specifies message type. The following mtypes are used by ABB MasterNet:

mtype	**category**
17	MasterBus 300/300E
30	MasterBus 200, see Appendix A, MasterBus 200.

For other mtypes, please refer to the relevant user's manual.

6.3.2 MasterNet System Messages

All MasterNet system messages in MasterPiece 200/1, MasterView 800/1 or MasterGate 230/1 stations use mtype 17 (MasterBus 300/300E) or 30 (MasterBus 200).

Mtype 17: MasterBus 300/300E

code **meaning**

1 Configuration error

Data1 = error code:

1 - 12, 26 - 27 = internal error; please report to ABB Automation

13 = reserved

14 = error in transceiver connection.

Data2 = H'RRNENWNO

RR = reserved

NE = network number strapped on communication board

NW = source network number in received route message

NO = source node number in received route message

Error in network number strap address on communation board

15 - 20 = reserved

21 = duplicate station address on MasterBus 300/300E

Data2 = node number

Change node number

22 = more than one node number in the station.

Data2 = subnet and node number

Change node number

23 = station connected to more than one Control Network

Data2 = subnet and node number

Change subnet number if the station is to be connected in a Control Network. Change node number if the station is to be connected in the Plant Network.

24 = slave processor board not compatible with slave handler software in host processor.

Data2 = slave number and subnet number

25 = error in network number in station (illegal configuration of network number)

Data2 = subnet and node number.

Change network number

33 = wrong routing protocol received

Data2 = H’RRNENWNO

RR = Reserved

NE = Network number on communication channel

NW = Source network number in received route message

NO = Source node number in received route message

Wrong protocol type is strapped on CS513 or in the source of the routed message.

34 = corrupted routing message received

Data2 = H’RRNENWNO

RR = Reserved

NE = Network number on communication channel

NW = Source network number in received route message

NO = Source node number in received route message

50 = the slave is out of range

Data2 = H’LRSLCPSP

LR = Logical record in data base

SL = Slave number

CP = Carrier position number

SP = Submodule position on carrier

51 = the MVI carrier or submodule position defined in data base is out of range

Data2 = the same as for “Error 50”

52 = the MVI carrier and submodule position defined in data base is already used by another submodule

Data2 = the same as for "Error 50"

53 = the slave number is already used by another submodule

Data2 = the same as for "Error 50"

54 = the LAN channel is already used by another LAN submodule

Data2 = the same as for "Error 50" but SL = 9X with X = channel number

code **meaning**

2 Resource error

Data1 = type of resource

9, 15, 16 = reserved

17, 20 - 25 = internal error; please report to ABB Automation

18 = too many stations connected to MasterBus 300/300E.

Data2 = subnet number

19 = error in allocation of memory at system start up

Data2 = 0 host processor

> 0 slave processor number

26 = error in allocation of memory to MAC receive rings

Data2 = 0

code **meaning**

3 Disconnect

Data1 = type of connection

11 = data link

Addr = disconnect reason (HEX 5200 - 5500) reserved

Data2 = disconnect reason

1 = internal error; please report to ABB Automation

2 = DSCS 140/145 MAC transceiver heart beat failure. Check physical connection.

3 = DSCS 140/145 DMA error. Change DSCS 140/145 board.

13 = network path disconnected

Data2 = H'RRAANENO

RR = disconnect reason

00 = destination node unreachable

80 - 9F, FF reserved

AA = DSCS 140/145 = slave number, otherwise channel number

00 = all paths to destination

NE = subnet number

NO = node number

code	**meaning**
7	Reconnect

Data1 = type of connection

13 = network path reconnected

Data2 = H'0000NENO

NE = subnet number

NO = node number

code	**meaning**
8	Hardware error

Data1 = 01, communication board (DSCS 140/145)

Data2 = H'SLTTNENO

SL = slave number

TT = type of error

01 = LANCE failed to initialize;

SL and NE = 00

02 = Hardware error or electrical interference on coax or drop cable;

SL and NE = 00

03 =Communication board has halted

04 =Bus error from slave handler when accessing the slave board

NE = network number

NO = node number

Data1 = 02, IEEE 802.3 MAC error

Data2 = H'CCSSERC4

CC = Board position in rack

SS = Module position on carrier

ER = Error number

00 = First transmission after init failed

03 = Checksum error in received frame, ccss = source node

04 = Board missing or not accessible

0A = Late collision while transmitting a frame

0B = Loss of carrier from Transceiver

0D = Controller failed to transmit frame

ccss = Time Domain Reflectometry. (ccss/10 gives distance in meter to a suspected cable fault.)

44 = Controller failed to initialize.

48 = Babble error. Indicates an attempt to send a frame longer than 1518 byte.

49 = Transceiver Heart beat error. The transceiver is not properly connected or the transceiver SQE Test is not working.

4A = Memory error

4D = Controller is restarted

CH = MAC channel number (1 or 2)

Data1 = Board type

03 = SC520/SC530

Data 2 = H'CC00EE00

CC = Board position in station rack

EE = Type of error

01 = Failed to initilaze

03 = Board has halted

04 = Board missing or not accessible

04 = CI532/CI535

Data 2 = H'CCSSEE00

CC = Carrier position in station rack

SS = Board subposition on carrier

EE = Type of error

01 = Failed to initilaze

03 = Board has halted

04 = Board missing or not accessible

05 = CI531

Data 2 = H'CCSSEE00

CC = Carrier position in station rack

SS = Board subposition on carrier

EE = Type of error

01 = Failed to initilaze

03 = Board has halted

04 = Board missing or not accessible

code	**meaning**
9	Hardware operable after failure

Data1 = communication board

Data2 = H SLTTNENO

SL = slave number

TT = 00

NE = network number

NO = node number

Data1 = Board type

03 = SC520/SC530

Data 2 = H'CC000000

CC = Board position in station rack

04 = CI532/CI535

Data 2 = H'CCSS0000

CC = Carrier position in station rack

SS = Board subposition on carrier

05 = SC520/SC530

Data 2 = H'CCSS0000

CC = Board position in station rack

SS = Board subposition on carrier

code	**meaning**
11	Clock Synchronization

Data1 = error type

1 = Clock Synch channels not found.

2 = Failed to select Clock Master. No capable neighbour.

3 = More than one Backup node. Set time again !!

4 = More than one Clock Master. Set time again.

5 = High precision time log. (Only if Clock Synch log flag is set)

Data 2 = current time error in 0.1 ms units
Addr = XXXXBBBB

XXXX = Max occured error in 0.1 ms units
BBBB = Mean error during period.

Other errors, please report to ABB Industrial System AB.

6.3.3 Error Codes from the LANn Data Base Element

The values strapped by the user on the CS513 communication module are transferred by the system and are reflected in the Data Base Element for CS513 LANn. Errors are reported as avalue on the ERRTYPE terminal, see Figure 6-5.

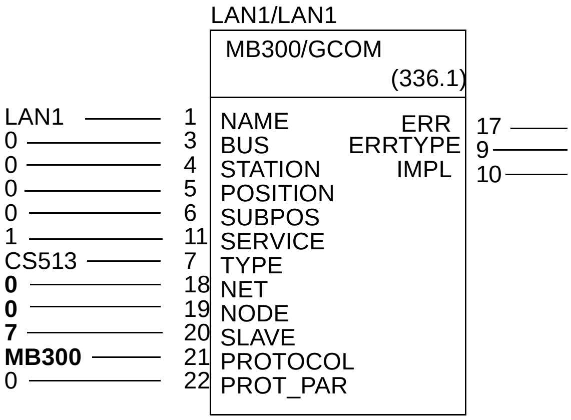


Figure 6-5. CS513 Data Base Element (LAN)

Table 6-6. Error Codes from LANn Data Base Element.

Type	Code	Interpretation
ermacaddr	21	Duplicate station address on network
ernode	22	More than one node number in station
ercntnet	23	Station connected to more than one Control Network
ernetw	25	Network number already used in Control Network
erbus	31	Module not found or internal bus error
erhwid	32	Incorrect hardware identity on module
erinit	33	Start-up of module failed
erhw	34	Suspected hardware error
erswid	35	Incorrect software identity on module
erifid	36	Incorrect module interface identity
erhbt	39	Heart beat (SQE) error from LAN transceiver
erslvno	50	Illegal slave number

Table 6-6. Error Codes from LANn Data Base Element. (Continued)

Type	Code	Interpretation
erpositi	51	Illegal module position
erdubpos	52	Double used module positions
erdubslv	53	Two modules has the same slave number
erdubmac	54	Two LAN modules have the same slave number for MB 300/300E in host

6.4 Fault Finding and User Repair

System messages report errors and similar events discovered by the MasterPiece 200/1, MasterView 800/1, Advant Station 500 series, Advant Controller 400 series or MasterGate 230/1 stations. They give information on the type of error, where the error occurred and, in many cases, they also give additional diagnostic information to indicate what caused the error, see Section 6.3.2, MasterNet System Messages.

By checking terminal "ERRTYPE" in the Data Base Element for CS513, you can get a hint about faults detected by the system in the Advant Controller 400 series, see Section 6.3.3, Error Codes from the LANn Data Base Element.

Chapter 7 MasterNet Clock Synchronization

7.1 Introduction

7.1.1 Scope and Objectives

The document gives an overview of the Clock Synchronization function in an Advant OCS® installation, and information on how to configure the Clock Synchronization function in the individual nodes of the installation.

7.1.2 Abbreviations and Terms

The following is a list of abbreviations and terms associated with MasterNet Clock Synchronization, that you should be familiar with.

Table 7-1. Abbreviations and Terms

Abbreviation/Term	Description
CM	Clock Master. A node in the MasterNet network that is assigned Master of supplying date and time.
CMBkp	Clock Master Backup. A node in the MasterNet network that is assigned Backup for the Clock Master.
CMCap	Clock Master Capable. A node capable of becoming Clock Master.
DST	Daylight Saving Time.
DSTM	Daylight Saving Time Master. A node that is assigned Master of distribution of time shifts in the local time presentation.
DSTMCap	Daylight Saving Time Master Capable. A node that is capable of being Daylight Saving Time Master (DSTM).
GW	Gateway Node. A node that interconnects Control Networks with the Plant Network.
IMS	Information and Management Station. A workstation based node.
OS	Operator Station. A workstation based node used for interaction with the Operator.
RTA board	Real Time Accelerator Board. Used mainly as a communication gateway processor in the workstation based nodes, when these are connected to the Control or Plant networks.

Table 7-1. Abbreviations and Terms (Continued)

Abbreviation/Term	Description
UTC	Universal Time Coordinated. The universal time base, Greenwich Mean Time (GMT).
Network segment	A part of the network not divided by a Repeater or Bridge equipment.

7.2 Overview

The date and time are continuously distributed in the network and synchronize the clocks in **Advant OCS** nodes. The relative time accuracy on a MasterBus 300 network segment (with High Precision Time Synch) is better than 3ms. If an accurate time base is required an external time source (minute pulses) can be connected to some of the nodes, which then improves the correctness of the absolute time to better than 2ms. Time synchronization through other networks (without High Precision Time Synch) like GCOM gives a time accuracy better than 1 s.

The nodes in the network play different roles in the process of keeping the date and time synchronized among the nodes. One node is assigned **Clock Master** and sends periodically time synchronization telegrams to the other nodes. One node is assigned **Clock Master Backup** and will assume the Clock Master role in case the currently active Clock Master ceases to work. Besides these two nodes there may be several other nodes that are capable of assuming the role of Clock Master or Clock Master Backup. E.g. in case the currently assigned Clock Master Backup ceases to work, another Backup is assigned among the nodes that are Clock Master Capable.

Both the **Clock Master** and **Clock Master Backup** nodes must reside on the same Control or Plant network. The **Gateway Node** that interconnects Plant and Control networks must be configured to forward the time synchronization telegrams between the networks. The Gateway node itself must never become Clock Master.

7.2.1 Time Zone Support

The workstation based products in the **Advant OCS** Family, Operator Stations (OS) and Information Management Stations (IMS), have support for handling different **Time Zones**. Such a Time Zone might also define a Daylight Saving Time period (sometimes called Summer Time Period) which means that the presented local time shifts e.g one hour forth and back, two times a year.

In order to make time based functionality such as History logging and Trend presentation to work over Daylight saving shifts, all involved Advant Stations must have identical Time Zone configuration. The time zone is configured as part of the installation of all Advant Station software.

The other nodes on the network, mainly Advant Controllers and Gateway nodes, maintain only one local time. To take advantage of the Time Zone support in the workstation based nodes, these nodes may be configured to distribute updates of the local time. In this case one of the workstation based nodes is assigned **Daylight Saving Time Master**. The local time is typically updated if a Daylight Saving Time period begins or ends. Both the **Daylight Saving Time Master** and **Clock Master** nodes must reside on the same Control or Plant network.

7.2.2 Setting and Modifying the Time Zone

In order to get the correct local time in the network at all time, and have it follow the Daylight Saving shifts defined for the local Time Zone, it is very important that all workstation based nodes are configured with the correct Time Zone information. (Generally, this applies for all nodes that supports Time Zones).

In the Advant Stations the current Time Zone is stored in the environment variable TZ. The TZ variable is automatically initialized with a pre-configured value at every start-up of the station, by reading the file /etc/TIMEZONE (or /etc/src.sh if hp-ux 9.0).

The Time Zone must be configured when the workstation is installed the very first time, and that is also part of the normal installation procedure. The configured Time Zone information is then stored in the file /etc/TIMEZONE (or /etc/src.sh if hp-ux 9.0) and should never be changed again. There is one exception - the Advant Stations come pre-configured from ABB production. If the ordering information is wrong or incomplete the TZ variable may be defaulted in a way that is not appropriate for the final installation. In this case, modify it according to the instructions below before you connect it to your Control network.

If the Time Zone configuration, for some reason, have to be changed after the installation is completed, this can be done under certain conditions:

- The workstation node, which should be reconfigured, must be disconnected from the Control Network.
- The Time Zone can only be reconfigured after logging in as 'root'.
- The Time Zone is reconfigured by typing the command: $/etc/set_parms timezone

Then follow the instructions in the following menus.

Please consult the HP Reference Manual, Volume 4, Section tztab For detailed information about the naming of Time Zone abbreviations.

7.3 Clock Synchronization Function

In order to understand the clock synchronization function in a network, one first has to understand the capabilities each individual node can have and how it may participate in the overall network clock synchronization.

7.3.1 Clock Synchronization Capabilities and Roles

Each node in the network can be configured to have two different capabilities regarding the clock synchronization function (see Table 7-2).

Table 7-2. Clock Synchronization Capabilities

	Capability	Description	Comment
CMCap	Clock Master Capable	The node is capable of assuming the role of Clock Master (**CM**) or Clock Master Backup (**CMBkp**)	Applies for all nodes.
DSTMCap	Daylight Saving Time (DST) Master Capable	The node is capable of assuming the role of Daylight Saving Time Master (**DSTM**)	Applies only for OS nodes, IMS nodes.

The actual work performed by the node, regarding the clock synchronization function, is controlled be the **role** that the node assumes (see Table 7-3)

Table 7-3. Clock Synchronization Roles

	Role	Description	Comment
CM	Clock Master	The node sends periodic time synchronization telegrams.	Applies for all nodes.
CMBkp	Clock Master Backup	The node monitors the reception of time synchronization telegrams, and assumes the Clock Master (**CM**) role if the telegrams cease.	Applies for all nodes, except for nodes on the GCOM network i.e. AdvaSoft for Windows and SuperView.
DSTM	Daylight Saving Time (DST) Master	The node sends a time setting telegram due to the start or stop of a DST period).	Applies only for OS nodes, and IMS nodes.

NOTE

A node that is Daylight Saving Time Master Capable (**DSTMCap**) and Clock Master Capable (**CMCap**) can also assume both of the roles of Clock Master (**CM**) and Daylight Saving Time Master (**DSTM**).

For information about how Capabilities and Roles for a node is selected see **Section 7.3.4.1, Selection of node Capabilities and Roles**

7.3.2 Distribution of Time Telegrams

The Clock Synchronization Function uses three types of time telegrams, and each node on the network can be configured to distribute these differently.

Table 7-4. Time Telegrams

Time Telegram	Description
Time Set Telegram	A new time is set (normally initiated by an operator) or due to start or stop of a DST period.
Standard Time Synchronization Telegram	**Applies only for the currently assigned Clock Master (CM):** A time synchronization telegram is sent periodically (cycle time is 10 minutes) to allow the receiving nodes to adjust their clocks.
High Precision Time Synchronization Telegram	**Applies only for the currently assigned Clock Master (CM):** On MasterBus 300 a time synchronization telegram is sent periodically to allow the receiving nodes to adjust their clocks, with high accuracy.

A node can be configured to **send** these time telegrams differently dependent on which type of network it is connected to, i.e. Control Network or Plant Network. A node can also be configured to **listen** to some of the time telegrams or none. Consequently, a node that does not listen to any of the two Time Synchronization Telegrams will not have its date and time continuously synchronized to the other nodes.

7.3.3 Clock adjustment realization

The nodes that receive the Time Set Telegrams and Time Synchronization Telegrams set the time momentarily or adjust the time "smoothly", according to the Table 7-5 below.

Table 7-5. Clock Adjustment Methods

Time Telegram	Adjustment method
Time Set Telegram	Clock is set momentarily.
Standard Time Synchronization Telegram	Clock speed is increased or decreased 10% until the clock is synchronized.
High Precision Time Synchronization Telegram	Clock is continuously adjusted. Calculates an average deviation and adjusts the clock accordingly. A time deviation greater than 1 s results in a momentary clock set.

7.3.4 Configurable Parameters in CLOCK_SYNCH Database

Each node contains a database element (**CLOCK_SYNCH**) that controls the behavior of clock synchronization function for the node, and how it will participate in the overall Network Clock Synchronization function.

Table 7-6. Clock Synch Database Element

	Item	Values	Description
	CLK_MAST	TRUE	CMCap, The node may become Clock Master
		FALSE	This node not can not become Clock Master
	LOC_TIME	0	Don't listen to any time telegram.
		1	Listen to **Time Set Telegram**.
		2	Listen to **Time Set Telegram** and standard **Time Synchronization Telegram**.
		3	Listen to **Time Set Telegram** and **High Precision Time Synchronization Telegram**. ***(Only on MasterBus 300 networks)***
Node Connected to **Control Network**	CLK_SEND	0	Don't send any time telegram.
		1,2 or 3	Send all types of time telegrams.
Node Connected to **Plant Network**	CLK_SEND	0 or 1	Don't send any time telegram.
		2	Send **Time Set Telegram**.
		3	Send **Time Set Telegram** and **Time Synchronization Telegrams**.

7.3.4.1 Selection of node Capabilities and Roles

Table 7-7.

Capabilities	Role
CMCap	A node is Clock Master capable if CLK_MAST = TRUE and CLK_SEND > 0.
CM	A node that is CMCap can become Clock Master in three ways: - A user sets the time in this workstation - The node is Clock Master Backup and the Clock Master supervision time is expired. - A user sets the time in a workstation with parameters CLK_MAST = FALSE and CLK_SEND > 0. In this case the workstation will search for an other CMCap node in the network and set it as Clock Master. This search starts from the node with the lowest node number.
CMBkp	The node with the lowest node number in the network and is CMCap will become Clock Master Backup. This selection is done by the Clock Master node.
DSTMCap	A node is DSTM capable if it is a workstation and CLK_SEND > 0.
DSTM	If the Clock Master node is DSTMCap then it is also DSTM. Otherwise the Clock Master will search for an other DSTMCap node in the network and set it as Daylight Saving Time Master. This search starts from the node with the lowest node number.

7.3.5 Configuration of Time Zone Support in Workstation Based Nodes

In the workstation based nodes, i.e. Operator station (OS) and Information Management Stations (IMS) the clock synchronization task is distributed between the RTA board software and the workstation's main software. The control or plant networks are connected via the RTA board, which mainly acts as a communication processor towards these type of networks.

In the RTA board software there are additional clock synchronization functions, besides these described earlier in this chapter, which inter-work with a clock synchronization function in the main system software (see Figure 7-1). The main purpose for these is to synchronize the time in the two software parts in the node, and also to distribute any shifts in the local time. Shifts in the local time normally occur only when Daylight Saving Time period begins or ends. This will be taken care of automatically if all Advant Station nodes have correct time zone configuration. The configuration of the clock synchronization function for these nodes are basically identical to all the other nodes' configuration. The configurability described in Section 7.3.4, Configurable Parameters in CLOCK_SYNCH Database applies for the RTA board software in the node. One additional configurable parameter controls the synchronization between the main system software and the RTA board software (see Table 7-8).

Table 7-8. Configuring Time Synchronization in Configuration File: dxutsConfig

Configuration File: dxutsConfig		
Parameter	**Value**	**Description**
REVERSED_SYNC_MODE	0	(**Default**) The RTA board synchronizes the UTC clock in the workstation system.
	1	The workstation system synchronizes the time in the RTA board software (cyclicity configurable but typical 5-10 s). This setting is used if time is to be received from TCP/IP.

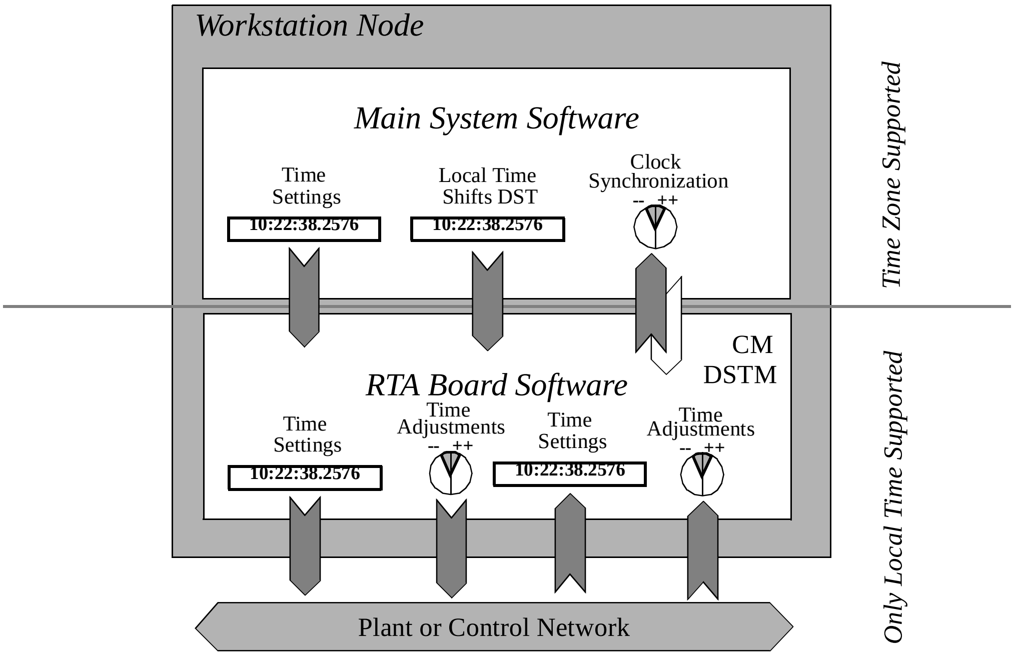


Figure 7-1. Clock Synchronization Tasks in the Work Station Nodes (REVERSED_SYNC_MODE=0)

A user may also set a new time in the workstation and this new time is always copied to the RTA board software. If the RTA board is configured to send Time Set Telegrams (see Table 7-3) the new time is broadcasted on the network too.

7.4 Summary of Time Synchronization Function in One Node

The Figure 7-2 below shows how the different values in the Database element, **CLOCK_SYNCH**, influences the transmission and reception of Time Telegrams.

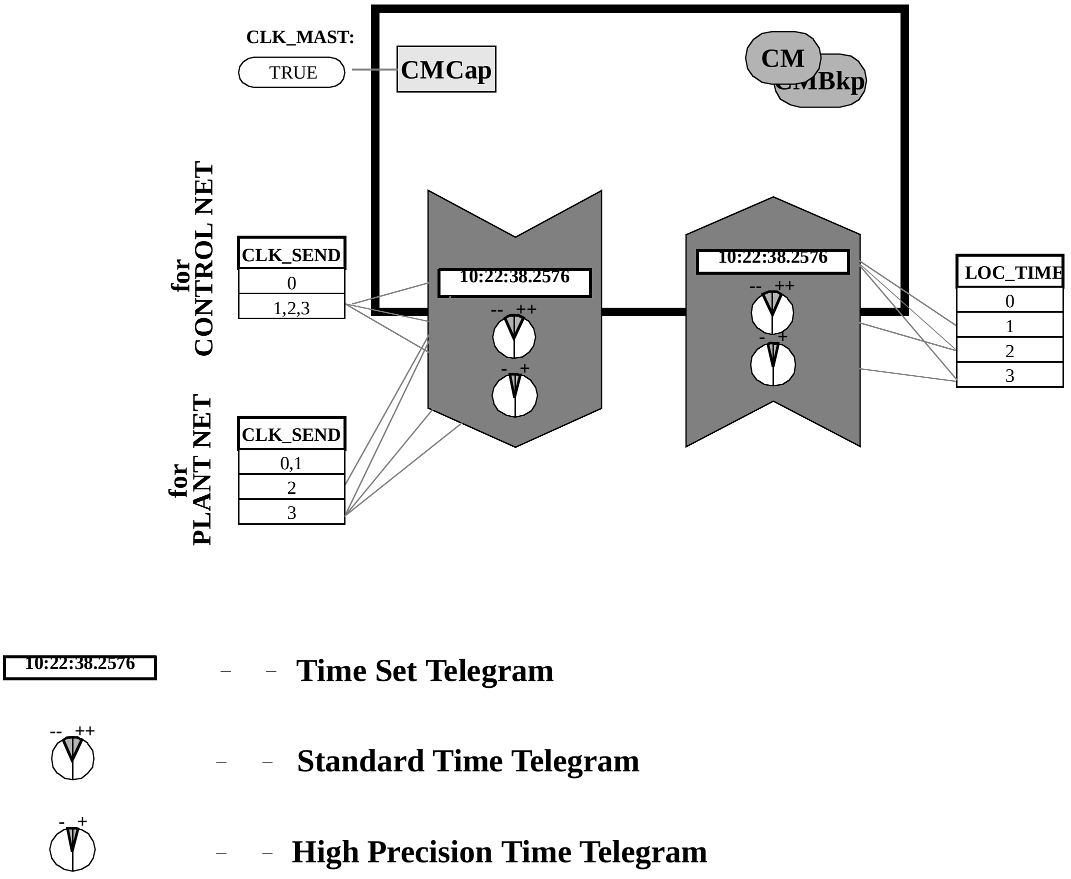


Figure 7-2. Time Telegram Transmission and Reception in a node.

The Figure 7-3 below shows how the different values in the Database element, **CLOCK_SYNCH**, and the configuration file, **dxutsConfig**, influences the transmission and reception of Time Set Telegrams and Time Synchronization Telegrams in a Workstation Based node.

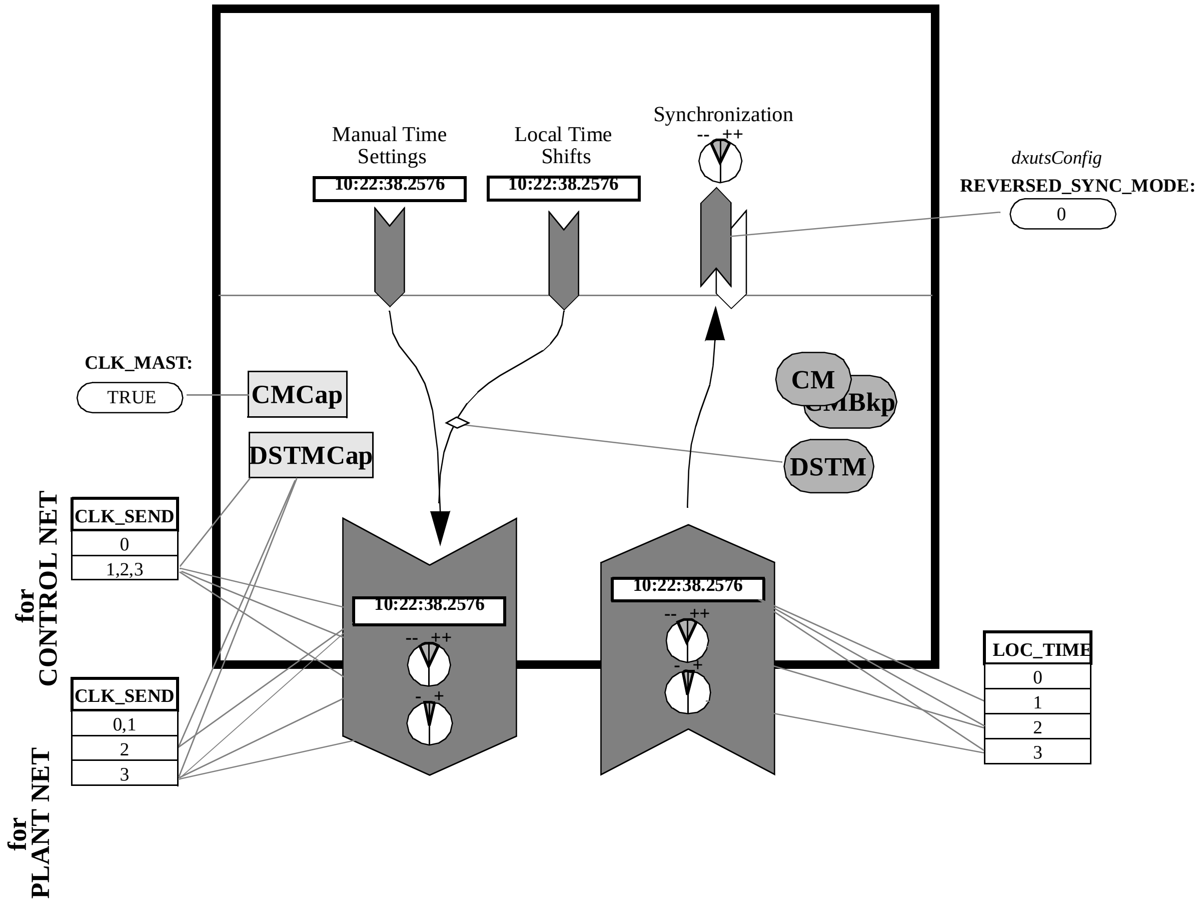


Figure 7-3. Time Telegram Transmission and Reception in an Workstation Based Node

If the node is configured to receive time telegrams, the Local Time is kept updated continuously in the RTA board software as well as the Universal Time and Local Time in the Main System software (provided REVERSED_SYNC_MODE = 0).

Manual Time Settings and Local Time Shifts, that may happen in the Main System Software, are always propagated to the RTA board software. The Time Settings will be broadcasted on the network if the node is configured to send Time Set Telegrams. Local Time Shifts are only broadcasted on the network if the node is Daylight Saving Time Master (DSTM).

NOTE

If REVERSED_SYNC_MODE is set to one (1), the LOC_TIME variable in the database element must be set to zero (0). Otherwise, Time Synchronization Telegrams received from the network will “struggle” with Time Synchronization Telegrams received from the Main System software.

7.4.1 Restrictions for MasterPiece, MasterGate 230/1 and MasterView 8X0/1 Nodes

If MasterPiece 200/1 Nodes, MasterGate 230/1 Nodes or MasterView 8X0/1 Nodes are connected to the network, where workstation based nodes also are connected, these MasterPiece, MasterGate or MasterView nodes must never be configured to be Clock Master Capable (i.e. always set CLK_MAST=FALSE). If any of these nodes should become Clock Master, it is not capable to assign one of the workstation based nodes as DST Master. And if none of the workstation based node are the active DST Master, the Time Zone support will not work in the installation.

7.4.2 Restrictions for nodes synchronized via GCOM networks.

Nodes that are connected via the GCOM communication network, like SuperView 900 and PCs running AdvaSoft for Windows, have some limitations in the clock synchronization.

- High Precision Time Synch is not supported, i.e. the time accuracy for nodes synchronized on the GCOM network is 1 s.
- The SuperView 900 and AdvaSoft for Windows nodes do not assign any node as Clock Master Backup (CMBkp). These nodes will stay as the active Clock Master (CM) until they are reconfigured.
- The SuperView 900 and AdvaSoft for Windows nodes can not be Clock Master Backup (CMBkp).

Therefore these GCOM connected nodes are normally not configured as Clock Masters.

7.5 Configuration Examples

The following examples show how the Data Base Element CLOCK_SYNCH and the REVERSED_SYNC_MODE flag in a workstation shall be configurated in different network configurations.

7.5.1 Nodes on a control network

The Figure 7-4 below shows a configuration with two Advant Station nodes and two Advant Controller nodes connected to a Control Network and one Controller node connected to a Local Control Network.

Both Advant Station nodes are capable of assuming the Clock Master role (CMCap). One Advant Station node is the active Clock Master(CM) and one is the Clock Master Backup (CMBkp).

The Advant stations nodes are both capable of assuming DST Master role (DSTMCap), and one of them is the active DST Master (DSTM). A manual setting of time is possible in any of the two Advant station nodes, and the new time will be sent to all the other nodes.
The node in which the time last is set becomes Clock Master.

The first Controller node forwards time synchronization telegrams to a node one the Local Control Network. This node can not receive High Precision Time as the network is MasterBus 300E.

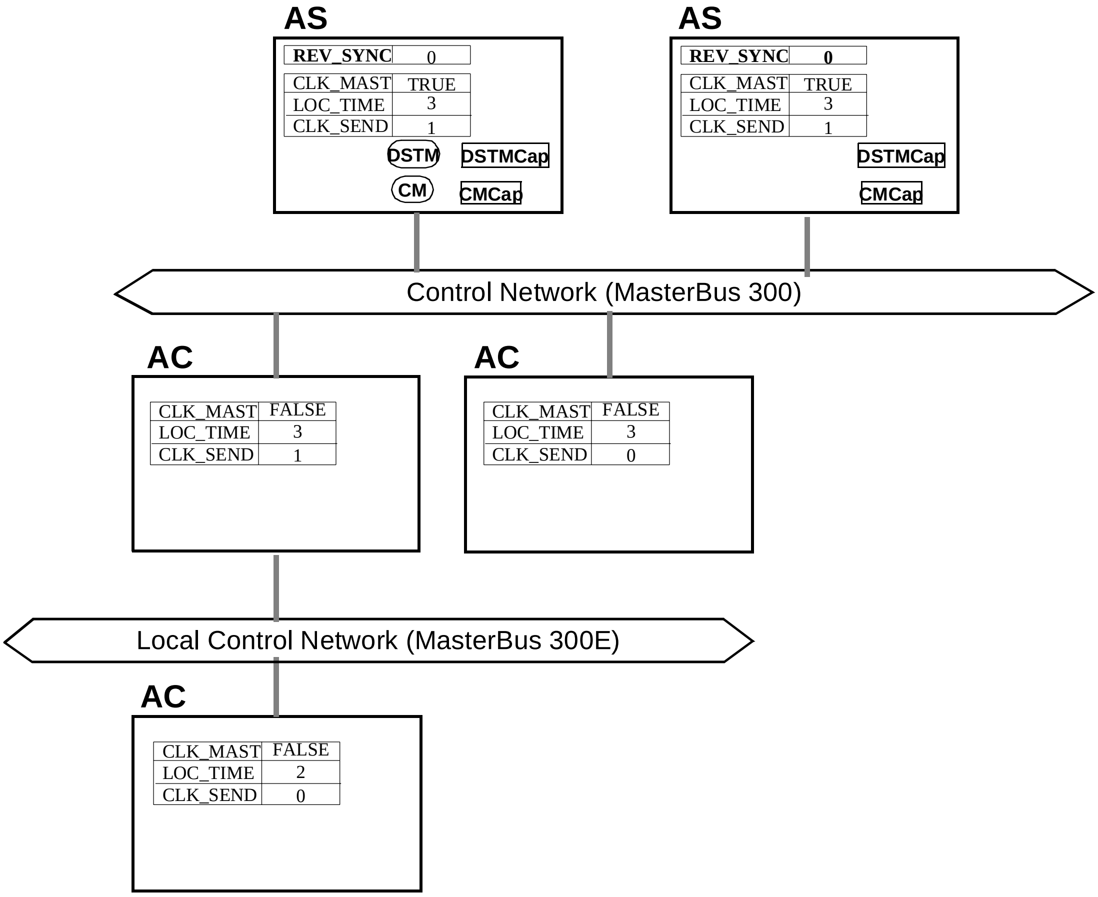


Figure 7-4. Example 1 - Control Network

7.5.2 Nodes on a Plant Network and Control Network, without external "Minute pulse"

The Figure 7-5 below shows a configuration with one Plant Network and one Control Network interconnected via a Gateway node. On the Control Network there are two Controller nodes. On the Plant network there are two Advant station nodes. Both of them are capable of assuming Clock Master(CMCap) role and assuming DST Master role (DSTMCap). One of them is the active Clock Master (CM) and the active DST Master (DSTM).

A manual setting of time is possible only in the Advant station nodes, those which are capable of assuming Clock Master role.

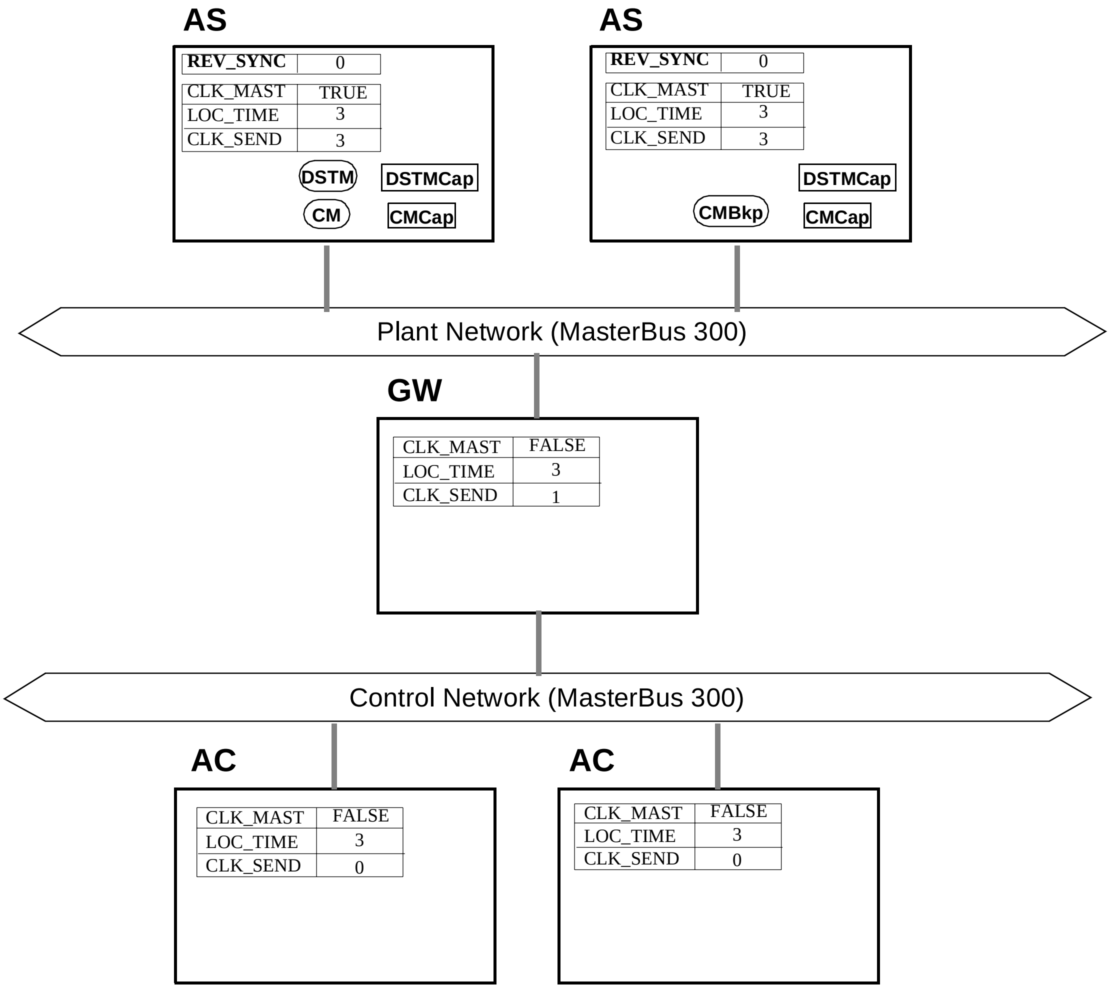


Figure 7-5. Example 2 - Plant Network and Control Network

7.5.3 Nodes on Control Network with external “Minute pulse”

The Figure 7-6 below shows a configuration with one Plant Network and one Control Network interconnected via a Gateway node. On the Control Network there are two Controller nodes which both have an external “Minute pulse” connected to achieve absolute time. Please find electrical data for Minute Pulse in the manual *Advant Controller 410/450 User’s Guide*, chapter System Clock.

The first node is the active Clock Master(CM) and the other node is Clock Master Backup (CMBkp). Only these two Controller nodes are capable of assuming the Clock Master role (CMCap). To the Control Network a workstation based node is also connected. It is the active DST Master (DSTCM) and thus the node in the network that maintains the Time Zone.

On the Plant network there is one Advant Station node. It is not able send time telegrams or capable to become Clock Master as we want one of the Controller nodes with "Minute pulse" connected to become Clock Master.

A manual setting of time is possible only in the Advant Station node on the Control Network. The Advant Station has CLK_MAST = FALSE and CLK_SEND = 1 to force selection of an other node on the same network as Clock Masters as itself is not capable.

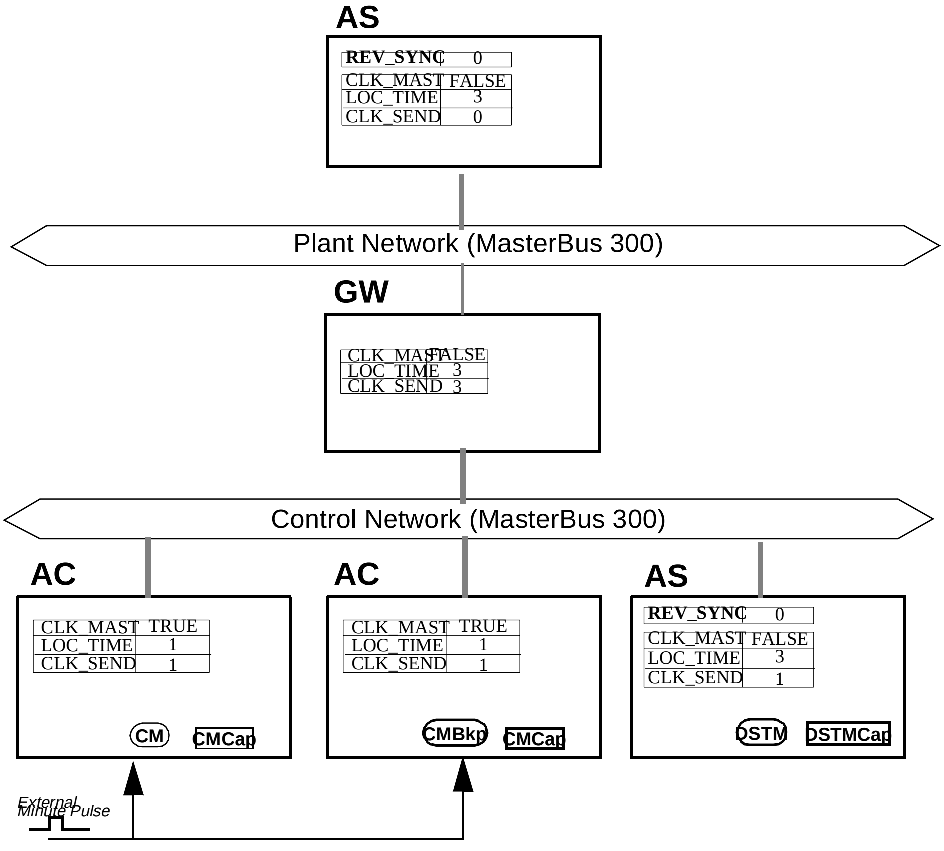


Figure 7-6. Example 3- Plant Network and Control Network, utilizing minute pulse

7.5.4 Nodes on a Plant Network and two Control Networks interconnected with Gateway nodes

The Figure 7-7 below shows a configuration with one Plant Network and two Control Network interconnected via a Gateway nodes. On the first Control Network there is one Controller node and one workstation node. The Advant station node is the active Clock Master(CM) and the Controller node is Clock Master Backup (CMBkp). Only these two nodes are capable of assuming the Clock Master role (CMCap). The workstation node is, at the same time, the active DST Master (DSTCM) and thus the node in the network that maintains the Time Zone.

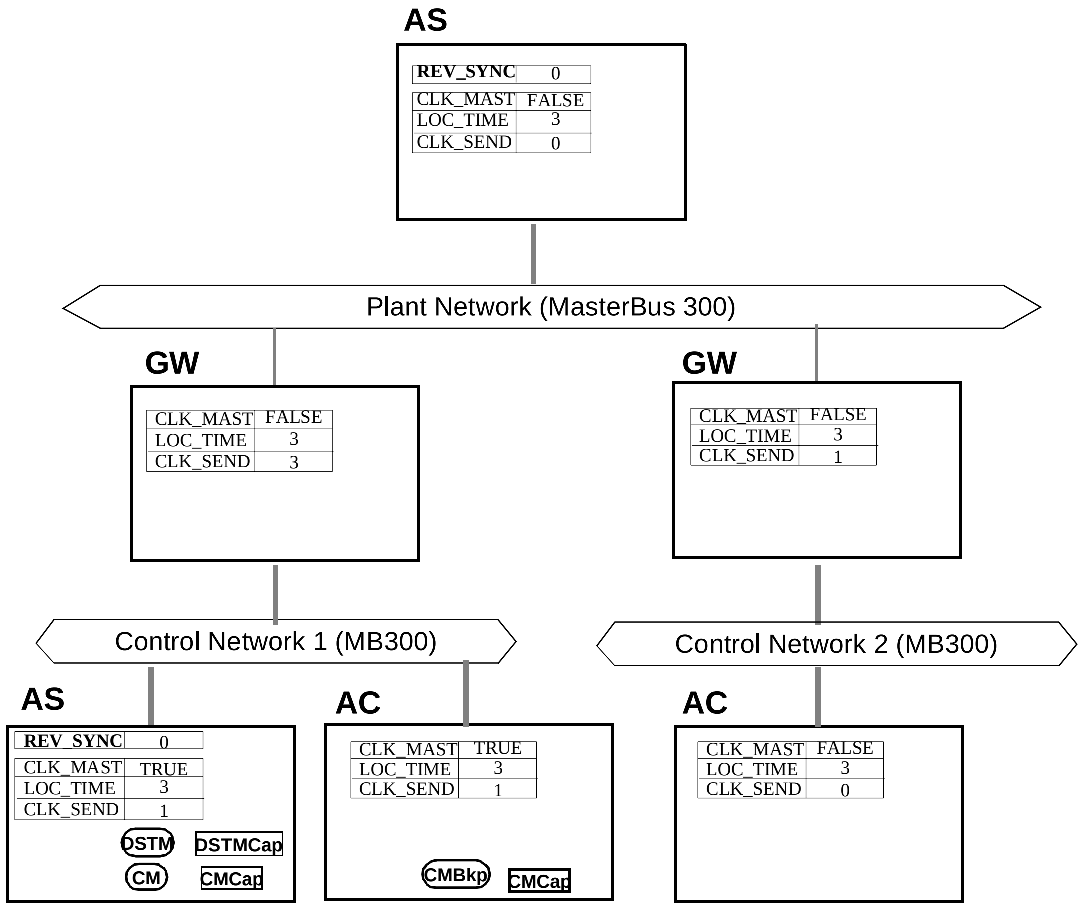


Figure 7-7. Plant Network and two Control Network interconnected with Gateway nodes

The time is distributed through the first Gateway node to nodes (a workstation node) on the Plant network, and further through the second Gateway node to the secondary Control network.

On the Plant network there is one workstation based node. It is not capable to become Clock Master or DST Clock Master. Neither is a manual setting of time possible in this node.

A manual setting of time is possible only in the Advant Station node on the first Control Network, since it's there the nodes capable to become Clock Masters exist.

7.5.5 Clock synchronization from GCOM network

Clock synchronization is controlled by alien computer connected via GCOM to one controller node. The alien computer sends a time set message followed by cyclic (every 10 minutes) adjust time messages. The controller node with CLK_SEND = 1 will forward the messages via MasterBus 300 Clock synchronization from GCOM networks gives a time accuracy within 1s.

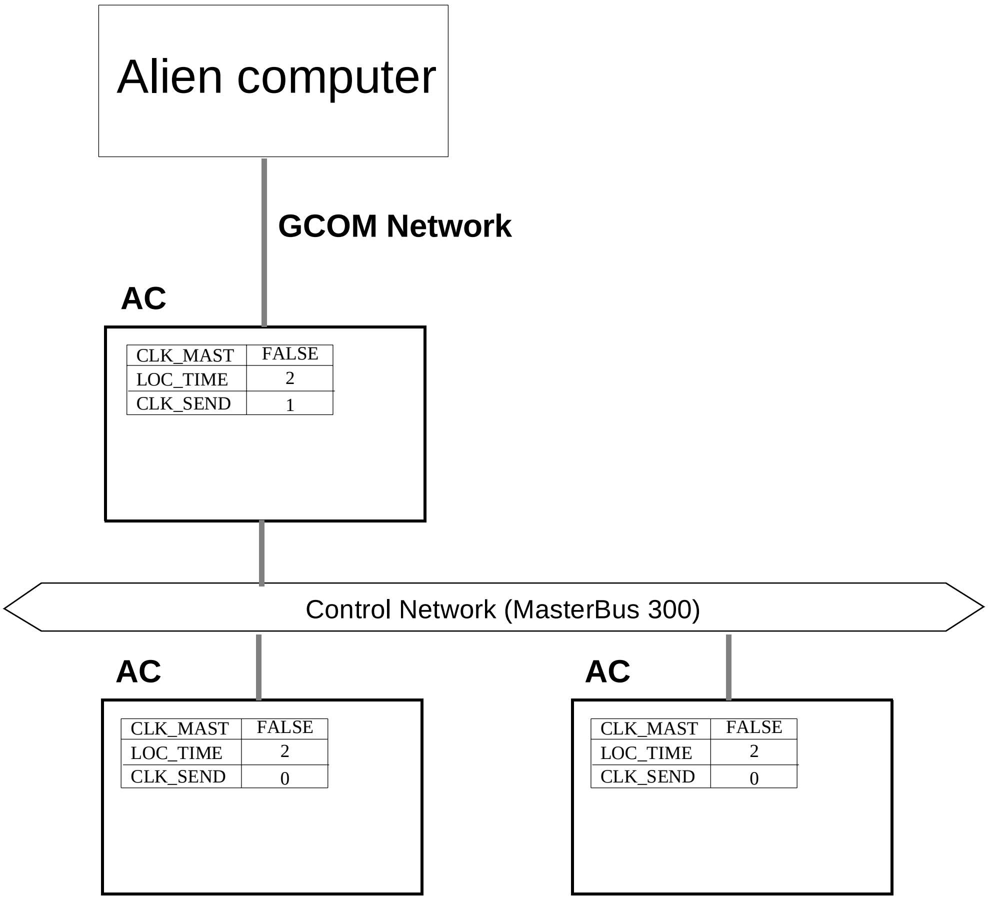


Figure 7-8. Nodes on GCOM network.

7.6 Summary of Rules for Clock Synchronization and Configuration

- At least two (2) nodes, residing in the same Network segment (i.e. having the same network number), must be configured to be potential Clock Masters (CMCap). Thus, the active Clock Master and its Backup Clock Master must always exist in the same Network segment.
- Support for Time Zones, and Daylight Saving Time (DST) support, are added to the network clock synchronization via workstation based nodes. These nodes must reside in the same network segment (i.e. same network number) as the potential Clock Masters reside, and must be configured to be potential DST Masters (DSTMCap).
- Workstation based nodes may be configured to be both potential Clock Master (CMCap) and potential DST Master (DSTMCap), if suitable.
- A MasterPiece, MasterView or MasterGate node must not be configured to be potential Clock Master (CM) or Clock Master Backup (CMBkp) if Daylight Saving Time (DST) support is used
- A SuperView 900 and AdvaSoft for Windows nodes do not assign any node as Clock Master Backup (CMBkp) and shall no be configured as Clock Master.
- Manual setting of time can only be done from workstation based nodes in the same network segment as where potential Clock Masters reside.
- All nodes that never need to send or forward synchronization telegrams on the network must have CLK_SEND=0.
- All nodes connected to an external time source (minute pulses) must have LOC_TIME = 1.
- The time accuracy for nodes synchronized from a GCOM network is 1 s. High Precision Time Synch is not supported.

Appendix A MasterBus 200

A.1 MasterBus 200 General

MasterBus 200 is a serial asynchronous half duplex multidrop RS 422 bus for medium communication distances with medium performance. Use MasterBus 200 to interconnect MasterPiece 200/1, MasterPiece 100, MasterView 800/1 and MasterGate 230/1 stations in a Control Network or in a Local Control Network.

MasterBus 200 is a connection-oriented confirmed data link service with segmentation and reassembly of user data. The bus traffic is controlled by a master station. Communication is possible between slaves as well as between master and slaves. The master cyclically polls all slaves. On each poll, a slave is given the opportunity to send one message to the master or to another slave. The master station can send one message to a slave between each poll.

In this way, the master station has quicker access to the bus than the slaves. Apart from this priority, the polling procedure is totally transparent to the user of the system.

In systems with MasterView 800, the MasterView is always the bus master. Traffic going out from MasterView, i.e., orders to MasterPiece, are given higher priority than incoming traffic, which mainly consists of display updates and event reports.

In Local Control Networks and on dedicated buses in a Control Network, all MasterPiece 200 slave nodes supervise the polling on the bus. If polling ceases, the bus mastership is transferred to one of the remaining MasterPiece 200 nodes on the bus. In this way, communication continues on the bus even if the master fails.

Messages can be transited from one MasterBus to another via an intermediate node.
The maximum communication distance is one "hop," i.e., via one intermediate node.
Only MasterPiece 200 stations within a Control Station are allowed to transit.

Physically, MasterBus 200 is multidrop type. You can use the bus without modems over distances up to 30 m, provided that all stations are connected to the same, well-defined grounding (common mode voltage <±7V). This is called a Short-Distance-Bus (SDB).

For distances over 30 m, or between units with different ground potential where isolation is required, you must use modems. This is called Long-Distance-Bus (LDB). With the modem DSTC 130 (isolation up to 2.5kV), the maximum distance is:

- In multidrop, up to 1 km between end points
- In point-to-point, up to 2 km between end points.

DSTC 131A is a modem for fiber optic communication. Use it only in point-to-point configurations. With this modem, the maximum distance is determined by the fact that the total attenuation in the cable, including joints, must be less than:

- 30 dB with 50/125 µm cable
- 33 dB with 62.5/125 µm cable
- 35 dB with 85/125 µm cable
- 36 dB with 100/140 µm cable.

The cable type and the number of joints determine the maximum length. The following maximum distance figures are based on using ABB CABLE fiber optic cables. There is one joint for every second km. There is also a margin of 6 dB hidden in these figures, which allows you to repair a broken cable.

- 7.0 km with 50/125 m cable
- 7.0 km with 62.5/125 m cable
- 7.0 km with 85/125 m cable
- 5.0 km with 100/140 m cable.

CAUTION

Each link in a redundant Long Distance Bus requires a separate pair of modems.

These modems must not be connected in series, but you can connect several modems in a star configuration. The network can cover an area with a radius of 2 km or 7 km, depending on the transmission medium.

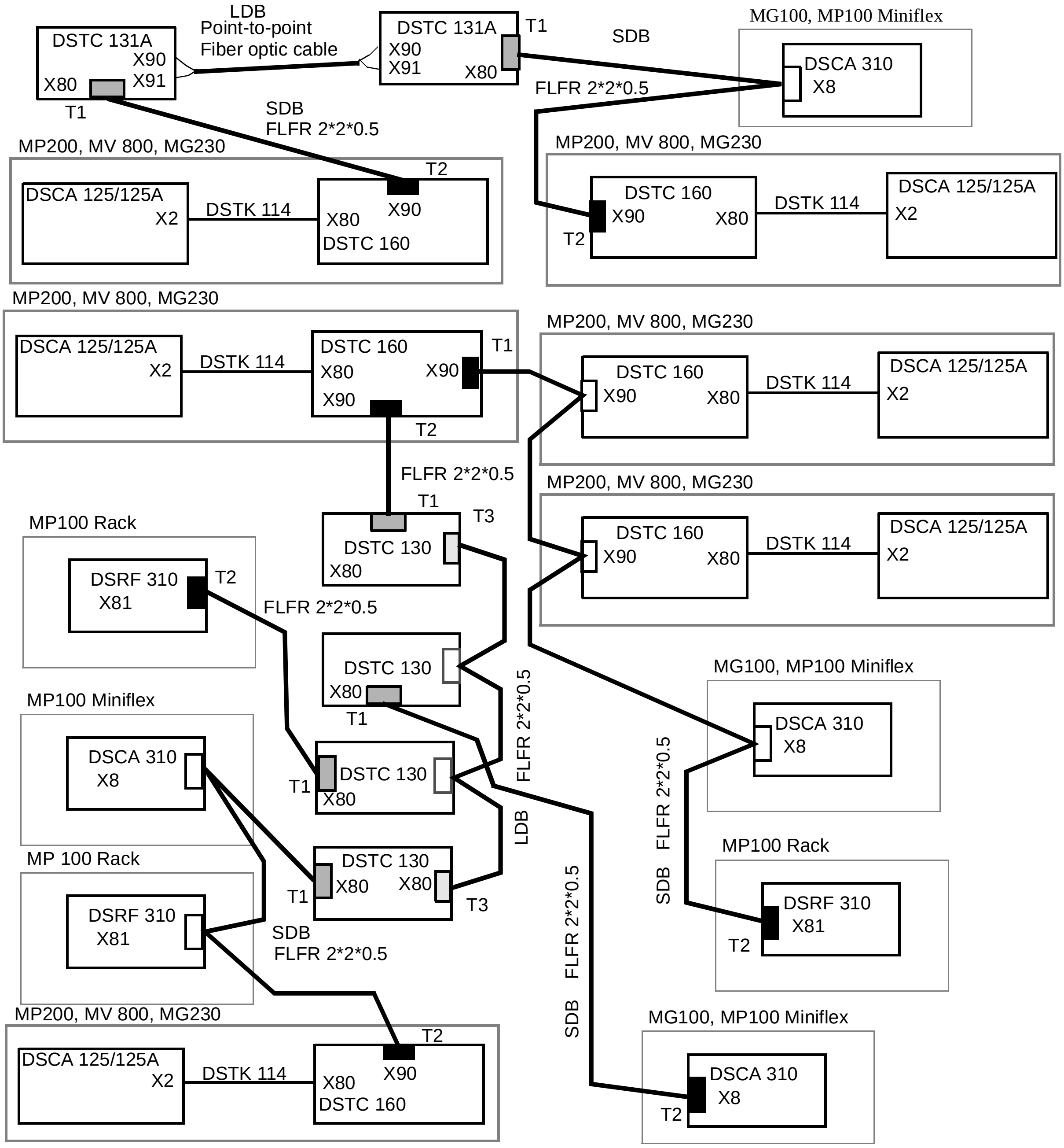


Figure A-1. MasterBus 200 Physical Configuration

A.2 Hardware

MasterBus 200 in MasterGate 100 and MasterPiece 100 miniflex version consist of an interface module DSCA 310 located at IM-position 8. MasterBus 200 in MasterPiece 100 rack version connects directly to the motherboard DSRF 310 RTXG connector.

MasterBus 200 in MasterPiece 200, MasterView 800 or MasterGate 230 consists of a rack-mounted communication board DSCA 125 and a connection unit DSTC 160 mounted on a mounting bar DSRA at the rear of the cubicle.

CAUTION

If you plan to install MasterBus 200 between buildings, the communication line must be protected by a suitable overvoltage protection (e.g., 5689 031-A) mounted at the bottom of the cabinet as close to the incoming line as possible.

MasterBus 200 Options

Table A-1. MasterBus 200 Hardware for MP 100 Miniflex or MG 100, SDB

Item	Identity	Ordering number
Communication board	DSCA 310	5752 0001 - AH
Cable	FLFR 2*2*0.5	1687 0032 - 1

Table A-2. MasterBus 200 Hardware for MP 100 Rack-mounted.SDB

Item	Identity	Ordering number
Cable	FLFR 2*2*0.5	1687 0032 - 1

Table A-3. MasterBus 200 Hardware for MP 200 MV 800 and MG 230, SDB

Item	Identity	Ordering number
Communication board (2*MB 200 links)	DSCA 125A	5752 0001 - GD
Cable (2*MB 200)	DSTK 114	2639 0582 - K
Connection unit	DSTC 160	5752 0001 - Z
Cable	FLFR 2*2*0.5	1687 0032 - 1

Table A-4. MasterBus 200 Long Distance Bus (LDB) Electrical Transmission.

Item	Identity	Ordering number
Modem	DSTC 130	5751 0001 - A
Cable	FLFR 2*2*0.5	1687 0032 - 1

Table A-5. MasterBus 200 Long Distance Bus (LDB) Optical Transmission.

Item	Identity	Ordering number
Modem	DSTC 131A	5751 0001 - BT
Cables from ABB KABEL:		
- Industrial environment (cable trays)	GNHKD	
- Ground and/or duct	GNHLKVD	
- Subsea	Coilsafe	
- Aerial	Lightspan	
- Indoor (office environment)	GNKD	

Table A-6. Additional Equipment for MB200 Communication Between Buildings.

Item	Ordering number
Overvoltage protection	56 89 031 - A

A.3 Performance

MasterBus 200 has the following capacity:

- Up to 10 Advant OCS stations per bus
- Up to 1000 m between end nodes in multidrop configuration
- If fiber optical transmission is used, then up to 7000 m between nodes in point-to-point configuration; otherwise up to 2000 m (electrical transmission).
- One bus connected to MasterPiece 100
- One bus connected to MasterGate 100
- Up to four buses connected to MasterPiece 200/1, MasterView 800/1 or MasterGate 230/1
- Two redundant physical lines per each MasterBus 200
- Speed 153.6 kbit per second.

MasterBus 200 can transfer a maximum of approximately 5 kBytes of information per second when communicating between the Master Station and a slave, and approximately 2.5 kBytes per second between slaves. This maximum capacity requires optimal utilization of the bus, e.g., that Data Sets have maximal size. If this is not true, the capacity is reduced because of the relative increase in overhead from polling and handshaking on the bus.

Communication is realized with the Explicitly Addressed Signal Service. This service includes an overhead in the information transferred of 12 bytes header. When calculating the actual bus load, this header must be included.

In MasterPiece 200/1, MasterView 800/1 and MasterGate 230/1, messages greater than 100 bytes of actual information are segmented and transferred in 112-byte packets. Only the first packet includes the overhead of 12 bytes header information and the last packet may contain less than 112 bytes. As an example, MasterView 800 display updates may be approximately 430 bytes and are segmented into four packets.

MasterBus 200 performance is sufficient for communication between one MasterView 800/1 and up to nine MasterPiece 200/1s, provided that the limitations specified for MasterPiece and MasterView are observed. Furthermore, no single MasterView display can contain dynamic data from more than five MasterPiece 200 stations. However, this performance is reduced if the bus is used for MasterPiece-to-MasterPiece communication with Data Sets.

Communication between MasterPiece stations should use a dedicated bus, not the bus connected to MasterView (except perhaps in very small systems with small requirements on communication). If a dedicated bus is not used, response times in MasterView increase. This is controlled at installation by turning off the transit option in all stations that are only connected to the MasterBus 200 MasterView bus and by specifying the dedicated bus as the destination network in the data sets.

Do not turn off the transit option for stations connected to both MasterBus 200 and MasterBus 300.

Communicating nodes load the MasterBus 200 as follows:

Table A-7. Bus Load in% per MB 200 Segment, Master-to-Slave Communication

S < = 20 byte	20 < S < = 100 byte
1%	P%

Table A-8. Bus Load in% per MB 200 Segment, Slave-to-Slave Communication.

S < = 20 byte	20 < S < = 100 byte
2%	2 * P%

where $P = 0.55 + 0.015(S + 12)$ and S = size of actual information (data), bytes/second.

Please note that the capacity is approximately 10 percent higher when communicating in both directions between the master and the slave stations. For communicating between MasterPiece 200 stations, the following values apply:

- A maximal data set (24 DAT values and including the 12-byte header) per second corresponds to approximately:
  - 4.2% bus load when communicating slave to slave.
  - 2.1% bus load when communicating master to slave.
- A minimal data set (1 DAT value and including the 12-byte header) per second corresponds to approximately:
  - 2% bus load when communicating slave to slave.
  - 1% bus load when communicating master to slave.

Approximately 20 maximal data sets per second represents 100% bus load.

In MasterPiece 100 and MasterGate 100 stations, segmentation is not implemented.
The maximum packet size of actual information is restricted to 24 bytes (excluding the 12-byte communication header).

For communication between MasterPiece 100/MasterGate 100 stations or between MasterPiece 100/MasterGate 100 and MasterPiece 200 stations, the following values apply:

- A maximal data set (5 DAT values and including the 12-byte header) per second corresponds to approximately:
  - 2 percent bus load when communicating slave to slave.
  - 1 percent bus load when communicating master to slave.
- A minimal data set (1 DAT value and including the 12-byte header) per second corresponds to approximately:
  - 2 percent bus load when communicating slave to slave.
  - 1 percent bus load when communicating master to slave.

Transit of messages between buses (MasterBus 200, MasterBus 300/300E or via the GCOM protocol) loads the host processor in the intermediate MasterPiece 200 or MasterView 850 node as follows:

Table A-9. CPU Load in an Intermediate Node.

Intermediate node	DSPC 170 load (ms/signal)	DSPC 150 load
MB 200 <-> MB 300/300E	2.5 + 0.8*N	-
MB 200 <-> GCOM	2.5 + 0.8*N	-
MB 200 <-> MB 200	1.3 + 1.5*N	2 + 5*N

Where N = number of 112-byte segment.

A.4 MasterBus 200 Installation and Start-Up

This section describes how to install MasterBus in the various Advant OCS stations.

The maximum number of bus connections supported by each type of Advant OCS station is defined below:

Table A-10. Advant OCS Stations and MasterBus

Type	MasterBus 200	MasterBus 300/ 300E	Max. total
MasterPiece 100	1	-	1
MasterPiece 100T	1	-	1
MasterPiece 2X0	4	-	4

Table A-10. Advant OCS Stations and MasterBus (Continued)

Type	MasterBus 200	MasterBus 300/ 300E	Max. total
MasterPiece 200/1	4	2 + 2 (6)(1)	6
MasterView 820	2	-	2
MasterView 810/1	1	-	1
MasterView 830/1	1	1	1
MasterView 850/1	4	2	5(2)
MasterGate 100	1	-	1
MasterGate 210/ 215	1	-	1
MasterGate 230/1	4	4	8

(1) The maximum total number of boards of type DSCS 140, DSCS 145, DSCS 150, DSCA 180 or DSCS 180X is six.

(2) Maximum of three communication boards.

A.4.1 MasterPiece 100 and MasterGate 100

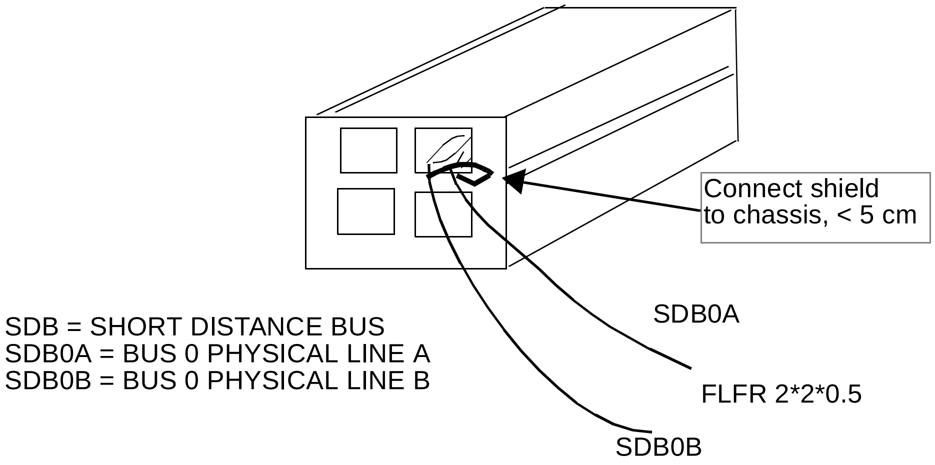


Figure A-2. MasterBus 200 Hardware in MasterPiece 100 Rack Version

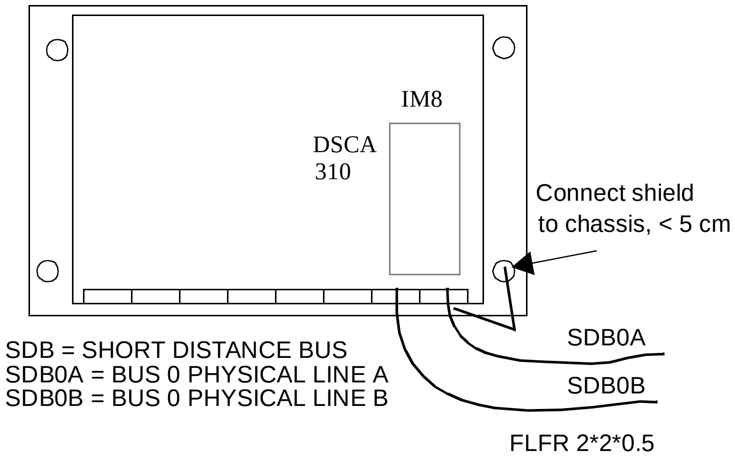


Figure A-3. MasterBus 200 Hardware in MasterGate 100 and MasterPiece 100 Miniflex

A.4.1.1 Short Distance Bus (SDB)

For the MasterBus 200 physical configuration, please refer to Figure A-1. You can connect one (1) MasterBus 200 to the DSRF 310 backplane X81 contact or DSCA 310 X8 contact.

Follow the instructions below:

- Use a maximum lead length of 30 m.
- The units on the SDB must be within the same electrical grounding plane (common mode voltage <±7 V, hence the 30 m limit).
- Use a maximum of 10 stations on the same SDB.
- Connect the cable shield (L<5cm) to the chassis.
- Route the SDB wiring in the cubicle together with communication cables with shield according to information in the manual *Advant® OCS Installation Rules*.
- Route cables between cubicles on cable ladders or ducts and with respect to distance to other cables. Minimum distance is 30 cm. Route the cable together with Advant OCS cables according to information in the manual *Advant® OCS Installation Rules*.
- Where the cable enters the cubicle, ground the cable shield directly or via a terminal block to the grounding bar. This limits the interference from adjacent cables.
- A suitable cable is FLFR 2x2x0.5 of four screw type with four conductors. A diagonal pair is used, e.g., white/blue, crop the other two directly at the cable shield.

NOTE

It is very important that the cable shield is connected short (<5 cm) to the chassis and that the cable shield is grounded at both ends. The shield should not be connected to 0V via X81 or X8.

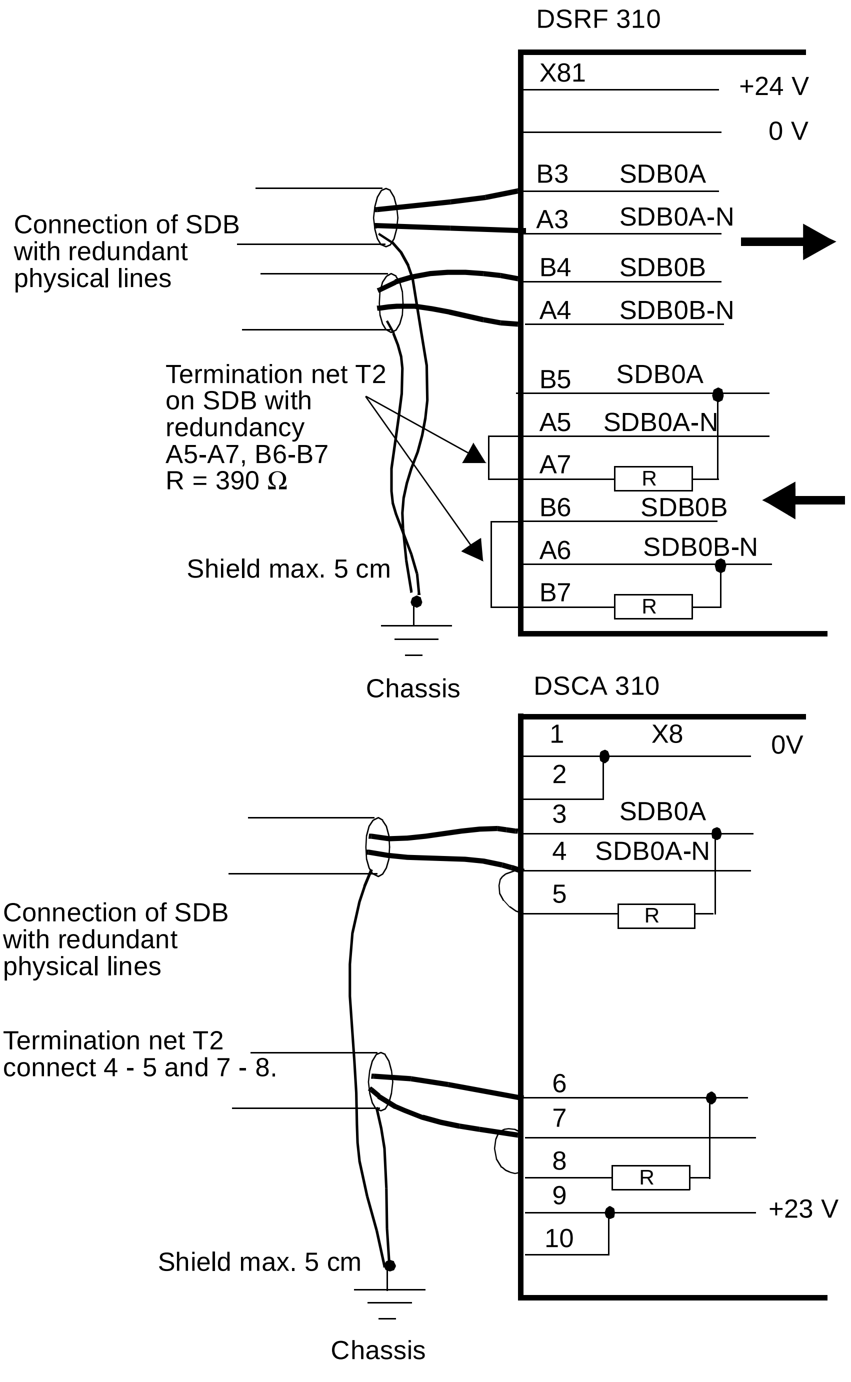

DSRF 310
X81
+24 V
0 V
B3
SDB0A
A3
SDB0A-N
B4
SDB0B
A4
SDB0B-N
B5
SDB0A
A5
SDB0A-N
A7
R
B6
SDB0B
A6
SDB0B-N
B7
R
Connection of SDB with redundant physical lines
Termination net T2 on SDB with redundancy A5-A7, B6-B7 R = 390 Ω
Shield max. 5 cm
Chassis
DSCA 310
1
X8
0V
2
3
SDB0A
4
SDB0A-N
5
R
Connection of SDB with redundant physical lines
Termination net T2 connect 4 - 5 and 7 - 8.
6
7
8
R
9
+23 V
10
Shield max. 5 cm
Chassis

Figure A-4. Connection of Cable at End Point of SDB (Termination Net T2)

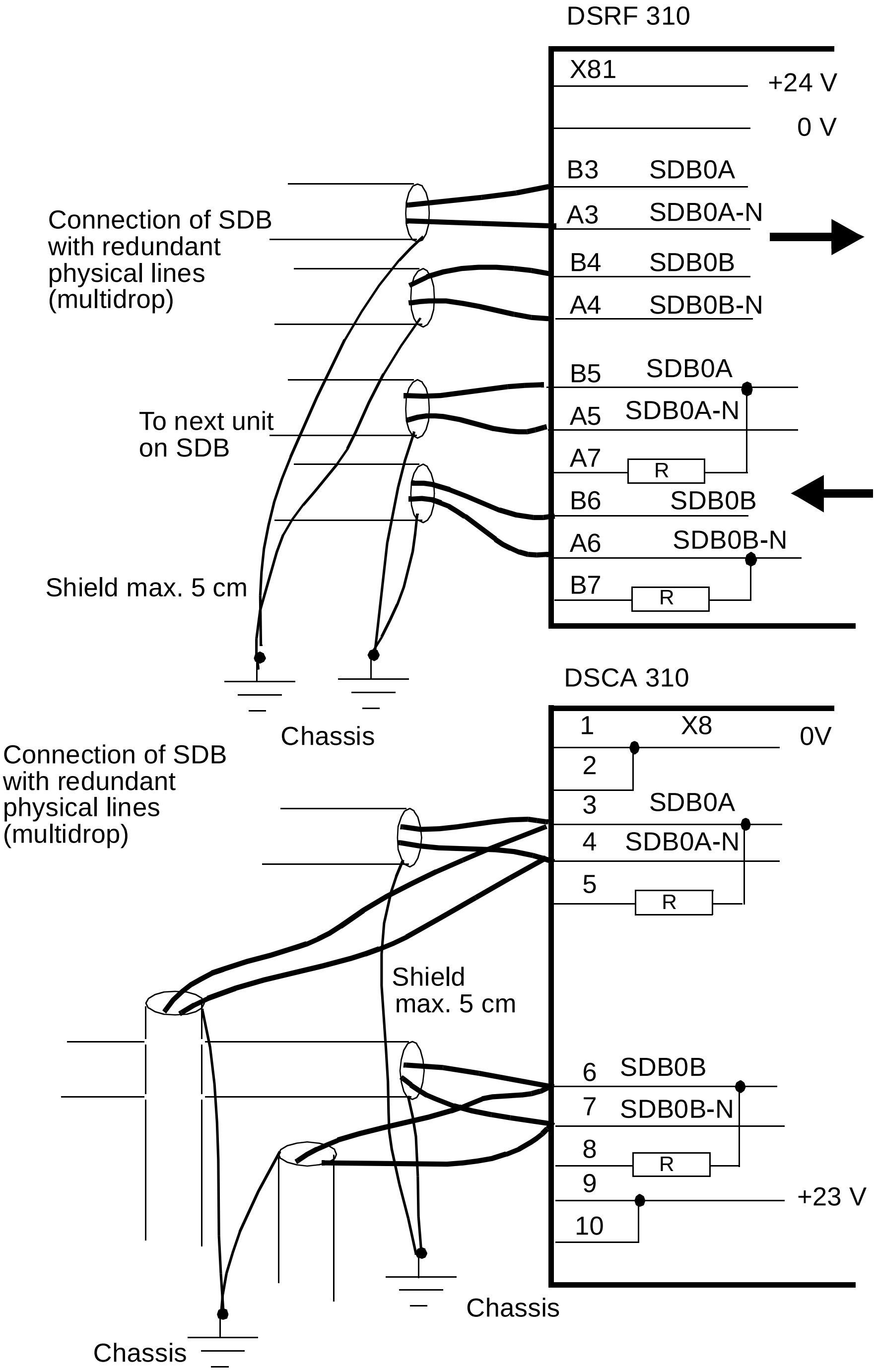


Figure A-5. Connection of Cable in Multidrop

A.4.1.2 Long Distance Bus (LDB)

Please refer to Section A.4.6, Long Distance Bus (LDB).

A.4.1.3 Communication Parameters

To start MasterBus 200, you must give the MasterPiece 100 and MasterGate 100 stations unique network and node numbers. You must define the input terminals COMADDR and COMNET for the SUPERV element to enable communication.

- COMADDR defines the node number for this MasterBus connection. Legal node numbers are 1-99.
- COMNET defines the subnet number for this MasterBus. Legal subnet numbers are 01-09.

To start up communication (via MasterAid) in MasterPiece 100 (or MasterGate 100), you must change COMADDR. One way of doing this is to set COMADDR to -1 in the PC program. After deblocking the PC program in the MasterPiece 100 station (or MasterGate 100), use the command MV (Modify Value) to define the node number.

To verify that the communication starts up properly, please refer to Section A.4.1.4, Verify MasterBus 200

A.4.1.4 Verify MasterBus 200

After the system is started, the LEDs on the processor unit panel indicate whether or not MasterBus 200 is connected properly.

Table A-11. LED Indicators for MB 200 in MP 100

Function	Panel LED indicators
MP 100/MG 100 transmits	T = flashing

A.4.2 MasterPiece 200/1, MasterView 800/1 and MasterGate 230/1

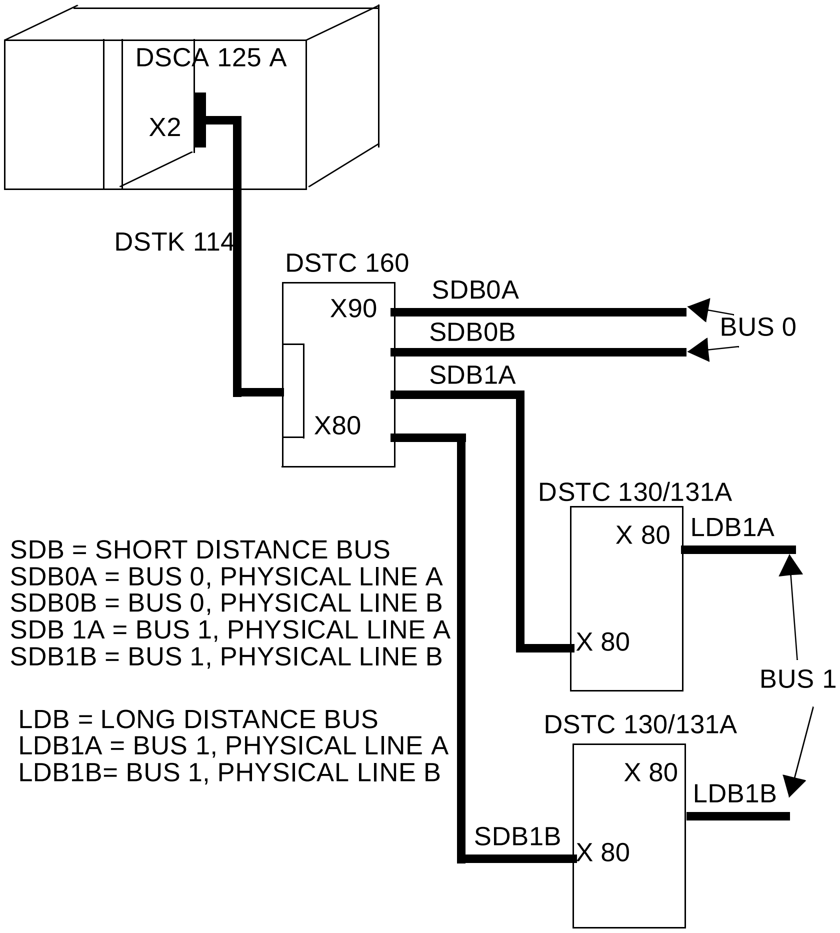

DSCA 125 A
X2
DSTK 114
DSTC 160
X90
SDB0A
SDB0B
BUS 0
SDB1A
X80
DSTC 130/131A
X 80
LDB1A
X 80
BUS 1
DSTC 130/131A
X 80
LDB1B
SDB1B
X 80
SDB = SHORT DISTANCE BUS
SDB0A = BUS 0, PHYSICAL LINE A
SDB0B = BUS 0, PHYSICAL LINE B
SDB 1A = BUS 1, PHYSICAL LINE A
SDB1B = BUS 1, PHYSICAL LINE B
LDB = LONG DISTANCE BUS
LDB1A = BUS 1, PHYSICAL LINE A
LDB1B= BUS 1, PHYSICAL LINE B

Figure A-6. MasterBus 200 Physical Configuration

A.4.2.1 Short Distance Bus (SDB)

For the MasterBus 200 physical configuration, please refer to Figure A-1. You can connect up to two MasterBus 200s from one DSCA 125/DSCA 125A board.

Connect DSCA 125/DSCA 125A to connection unit DSTC 160 via the cable DSTK 114.

Follow the instructions below:

- Use a maximum lead length of 30 m.
- The units on the SDB must be within the same electrical grounding plane (common mode voltage <±7V, hence the 30 m limit).
- Use a maximum of 10 stations on the same SDB.
- Connect the cable shield (L<5cm) to the DSTC 160 pin-marked chassis.
- Route the SDB wiring in the cubicle together with communication cables with shield according to information in the manual *Advant® OCS Installation Rules*.
- Route cables between cubicles on cable ladders or ducts and with respect to distance to other cables. Minimum distance is 30 cm. Route the cable together with Advant OCS cables according to information in the manual *Advant® OCS Installation Rules*.
- Where the cable enters the cubicle, ground the cable shield directly or via a terminal block to the grounding bar. This limits the interference from adjacent cables.
- A suitable cable is FLFR 2 x 2 x 0.5 of four screw type with four conductors. A diagonal pair is used, e.g., white/blue, crop the other two directly at the cable shield.

The cable is connected to screwed terminals and to DSTC 160 as shown in Figure A-7.

NOTE

It is very important that the cable shield is connected short (<5 cm) to the chassis terminal block on the connection unit DSTC 160 and that the cable shield is grounded at both ends and at entry to and exit from each unit along the SDB.
See below.

You can strap DSTC 160 in three different ways. The strapping depends **only on where** the DSTC 160 is connected to the SDB. For the best possible signal matching, SDB is provided with a termination net T1 at one end and a termination net T2 at the other end. Please refer to Figure A-1.

Do strappings for:

- Termination net T1 at one of the end points of the SDB
- Termination net T2 at the other end point of the SDB
- Units along the physical line in multidrop.

Please refer to Figure A-1.

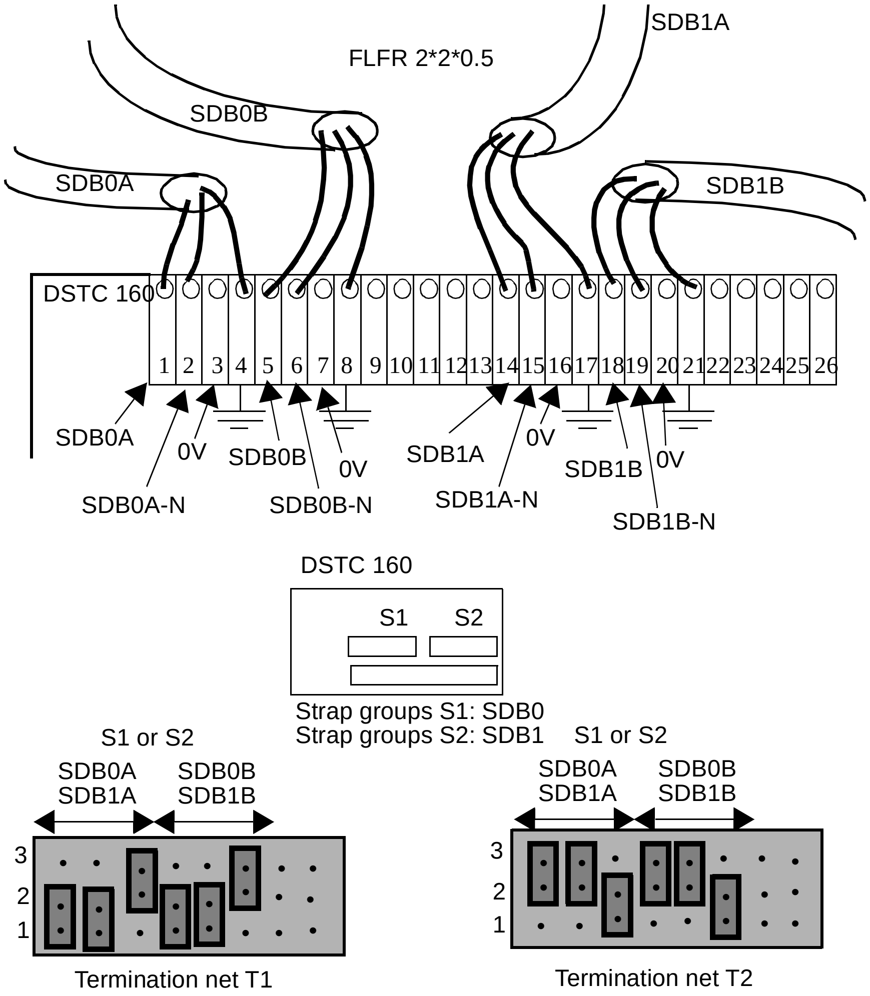
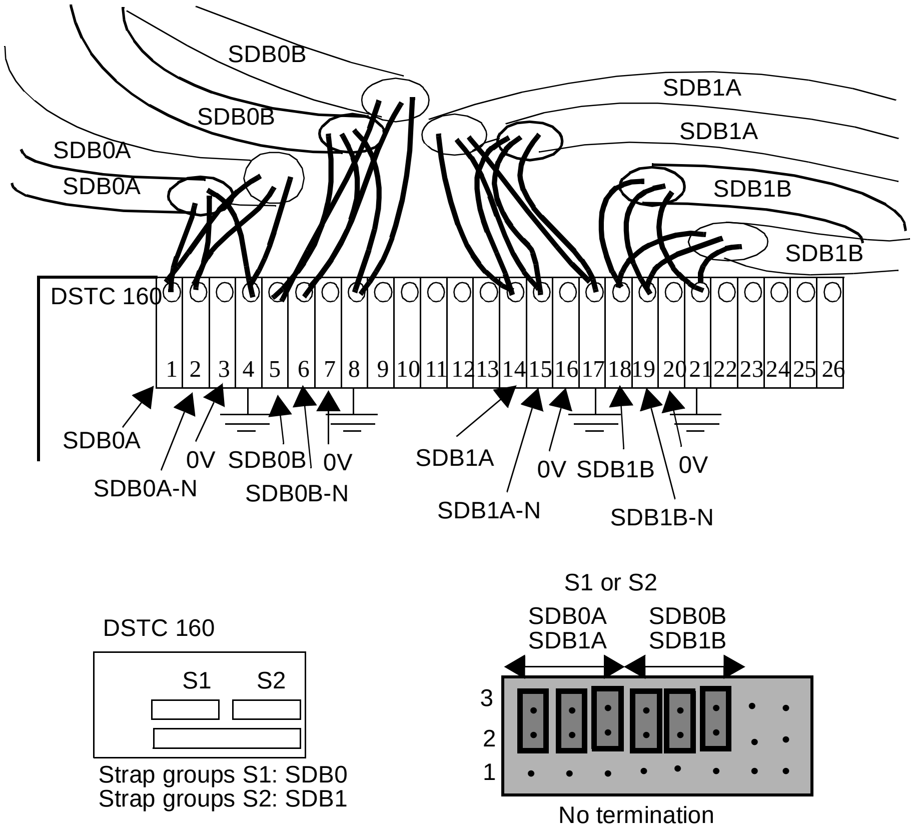


Figure A-7. Connection at End Points of SDB



Strap groups S1: SDB0
Strap groups S2: SDB1

Figure A-8. Multidrop Connection along SDB

A.4.3 Strapping of DSCA 125

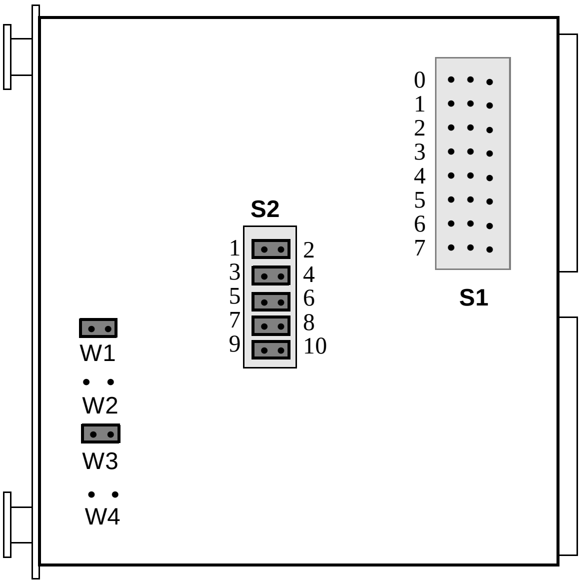


Figure A-9. DSCA 125 Strap Groups

I/O address and interrupt level:

The interrupt level is strapped in S1 bit 0 on the DSCA 125 board. The interrupt level is always “2”.

An I/O address should be assigned to each DSCA 125 MasterBus 200. The I/O address is strapped in S1 bit 1-7 on the board. DSCA 125 board 1 should have I/O address 10 HEX. The strapping of DSCA 125 board 1 is according to figure 35:1. DSCA 125 board 2 should have I/O address 12 HEX. The interrupt level is “2” and S1 is strapped according to Figure A-10.

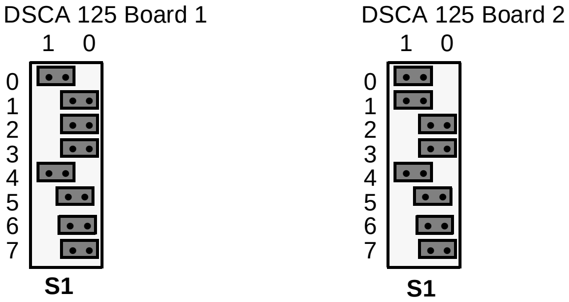


Figure A-10. Strapping of S1 on DSCA 125

The I/O addresses above correspond to bus #0 on the DSCA 125 board. I/O address for bus 1 is:

I/O address for bus 0 + 1

I/O address for bus 1 is automatically defined and not set by the user.

Test straps:

S2 test strap is used during factory test. S2 must be strapped as below:

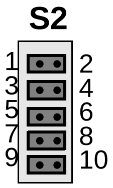


Figure A-11. Strapping of S2 on DSCA 125

Soldering straps:

DSCA 125 contains four solder straps, W1, W2, W3 and W4, which are factory set.

W2, W4 should be left opened.

W1, W3 should be connected.

A.4.4 Strapping of DSCA 125A

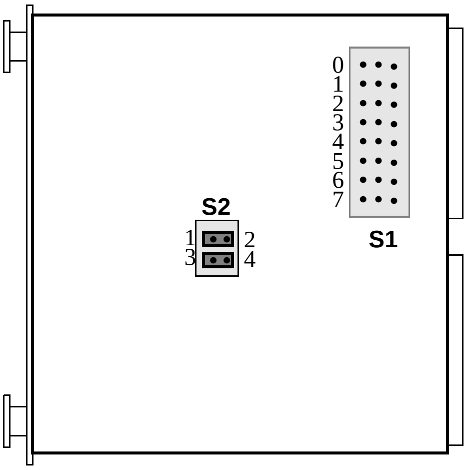


Figure A-12. DSCA 125A Strap Groups

I/O address and interrupt level:

The interrupt level is strapped in S1 bit 0 on the DSCA 125A board. The interrupt level is always "2".

An I/O address should be assigned to each DSCA 125A MasterBus 200. The I/O address is strapped in S1 bit 1-7 on the board. DSCA 125A board 1 should have I/O address 10 HEX. The strapping of DSCA 125A board 1 is according to Figure A-12. DSCA 125A board 2 should have I/O address 12 HEX. The interrupt level is "2" and S1 is strapped according to Figure A-13.

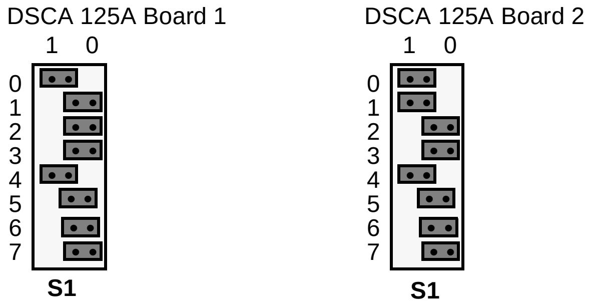


Figure A-13. Strapping of S1 on DSCA 125A

The I/O addresses above corresponds to bus #0 on the DSCA 125A board. I/O address for bus 1 is:

I/O address for bus 0 + 1

I/O address for bus 1 is automatically defined and not set by the user.

Test straps:

S2 test strap is used during factory test. S2 must be strapped as below:

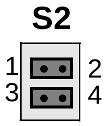


Figure A-14. S2 Test Straps on DSCA 125A

A.4.4.1 Long Distance Bus (LDB)

Please refer to subsection Section A.4.6, Long Distance Bus (LDB).

A.4.4.2 Communication Parameters

To start MasterBus 200, you must give some local communication parameters values. These parameters are defined below. MasterPiece 200/1, MasterView 800/1 and MasterGate 230/1 all include a data base. All communication parameters are stored under certain communication concepts in the data base. To update the Data Base Element, you must use MasterBus 200, MasterAid 200. Connect MasterAid 200 and boot it with the command MDB MB200A or, alternatively, MDB CAB1.1. The Data Base Element for the first MasterBus 200 is presented with its default values. The actual address to be strapped in strap group S1 on the DSCA 125/ DSCA 125A is presented in the header of the Data Base Element.

You can modify the default values with the sub-command M(modify), please see below. Leave the element with the command END. To verify that the communication starts up properly, please refer to Section A.4.1.4, Verify MasterBus 200 and Section A.4.5.1, Verify MasterBus 200.

Summary:

Communication parameters for MasterBus 200 are defined as data values of the MasterBus 200 element.

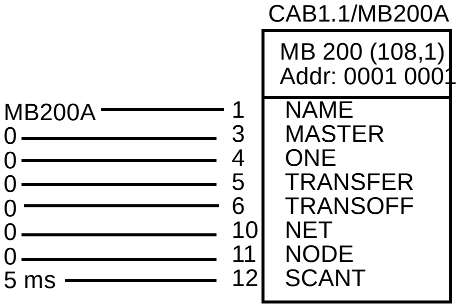


Figure A-15. MasterBus 200 Data Base Element

Head:

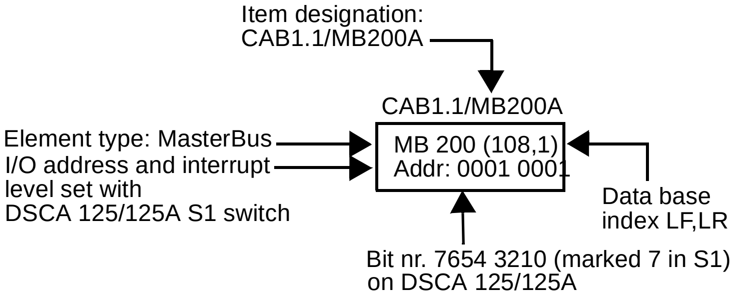


Figure A-16. Head of MasterBus 200 Data Base Element

Predefined DSCA 125/DSCA 125A I/O address:

Each DSCA 125/DSCA 125A communication board is connected to a Data Base Element via its I/O address and interrupt level. See the table below.

Table A-12. Predefined DSCA 125/125A S1 Settings

Data Base index	Item Designation	Name	S1 strap on DSCA 125/125A board	DSCA125/ 125A bus
108,1	CAB 1.1	MB200A	0001 0001	0
108,2	CAB 1.2	MB200B	-	1
108,3	CAB 1.3	MB200C	0001 0011	0
108,4	CAB 1.4	MB200D	-	1

Table A-13. Properties of DSCA 125/125A

No	Name	Value entered by	Default value	Description
1	NAME	predefined	-	Name of MasterBus. Should be one of these: MB200A, MB200B, MB200C or MB200D
3	MASTER	user	0	Controls whether or not the node should be the master on the bus. Value = 1 means that the node should be master. The following nodes should be defined as bus master stations: **Control Network**: MasterView 800 if installed, or else MasterPiece 200 connected to the central bus(es) **Dedicated bus:** MasterBus 200 only **Local Control Network:** MasterPiece 200 only
4	ONE	user	0	This property is relevant only for a bus master node and for a node which can take master control (see below, TRANSFER). The property defines whether the physical connection consists of one or two lines. Value = 0 means redundant lines. Value = 1 means one line. If only one link is installed, ONE should be set to 1 to indicate there is no faulty second line, to avoid error handling.
5	TRANSFER	user	0	Controls whether or not the node is allowed to be transferred from slave to master mode if the current master stops polling the slave stations. Value = 1 means master transfer is allowed. **Control Network:** Central bus: none Dedicated bus: If only one MP 200 is connected to the bus, then TRANSFER = 0 or TRANSFER can be set optionally. **Local control Network**: If only one MP 200 is connected to the bus, then TRANSFER = 0 or TRANSFER can be set optionally.

Table A-13. Properties of DSCA 125/125A (Continued)

No	Name	Value entered by	Default value	Description
6	TRANSOFF	user/ system	1	This property defines whether or not transit of messages between buses should be allowed. The following nodes should not be allowed to transit: **Control Network**: All MasterView 800 and MasterPiece 200 stations connected to the central bus(es). Only a station connected to both MB 200 and MB 300 should transit. Dedicated bus: none. **Local Control Network:** set to one by system.
10	NET	user	0	Defines the subnet number for this MasterBus. Buses in a Control Network are numbered: in Control Network 1 = 11-19 in Control Network 2 = 21-29, the buses in Local Control networks are numbered 1-9.
11	NODE	user	0	Defines the node number for this MasterBus. Legal numbers are in the range 1-99. The same node number must be used for all MasterBuses installed in one station.
12	SCANT	user	5 ms	Defines the poll time interval, i.e., beginning of poll cycles. This property is only significant for a bus master node or a node which can take the master control. Time is expressed in 5 ms units. (5ms-200ms) If polling is delayed, no attempt is made to catch up next cycle, so the average time interval may be longer than SCANT. If MP 100or MG 100 is connected to the bus, then the time is 50 ms or longer.

A.4.5 System Initialization

You can start communication in three different ways:

1. Leave the configuration mode.
2. Activate the INIT switch on the host processor front panel.
3. Activate communication via Network Management.

If you leave the configuration mode with the MasterAid 200/220 command DICONFIG or activate the INIT switch on the host processor, the Advant OCS system, including all its communication, is restarted.

If you activate the communication via Network Management, the communication package for the particular MasterBus 200 is restarted.

Normally, the Data Base Element MasterBus 200 is defined while the system is in configuration mode, i.e., start-up occurs with DICONFIG.

At each system initialization, the MasterBus 200 starts up or goes into a suspended state, depending on the contents of the Data Base Element. If NET or NODE is 0, the MasterBus 200 is waiting.

An inactive MasterBus 200 is activated when both NET and NODE are defined and system is initialized.

NOTE

> Since the system checks to ensure that all nonzero NODE numbers are equal in the station, you must change all NODE numbers to zero and reinitialize the system before a new NODE number is entered and accepted.

The system checks that NET is not selected for another MasterBus 200 or 300/300E.

A master node starts to poll within 15 seconds after system initialization. Please note that a slave node may not be polled within one minute, depending on the bus load.

A.4.5.1 Verify MasterBus 200

After you start the system (see above), the LEDs on the DSCA 125/DSCA 125A board indicates whether or not MasterBus 200 is connected properly. If the LED indicates problems or if nothing at all happens, please refer to Section 6.1.7, NM Service Version, to verify that everything is set up properly.

Table A-14. LED Indications

Function	DSCA 125/125A LED indicators
Master polls or slave responds	AI = flashing BI = flashing O = flashing
Master or slave receiving data	AI = flashing BI = flashing O = steady off
DSCA 125/125A out of function	F0 = steady on F1 = steady on O = steady off

At power on or system initialization, F0 and F1 are steady on until the bus is initiated with network and node number.

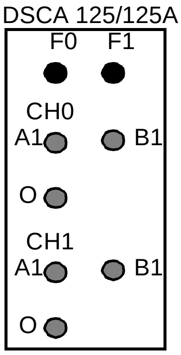


Figure A-17. DSCA 125/125A Front Panel

A.4.6 Long Distance Bus (LDB)

For MasterBus 200 physical configuration, please refer to Figure A-1. For distances over 30 m or between units with different ground potential (common mode voltage <±7V) where isolation is required, you must use modems.

With DSTC 130 the maximum distance is:

1. In multidrop, up to 1 km between end points
2. In point-to-point, up to 2 km between end points.

DSTC 131A is a modem for fiber optic communication and can only be used in point-to-point configurations. With this modem, the maximum distance is determined by the fact that the total attenuation in the cable, including joints, must be less than:

- 30 dB with 50/125 m cable
- 33 dB with 62.5/125 m cable
- 35 dB with 85/125 m cable
- 36 dB with 100/140 m cable.

The cable type and the number of joints determine the maximum length. The following figures for maximum distance are based on using ABB KABEL fiber optic cables, and there is one joint for every second km. There is also a margin of 6 dB hidden in these figures to allow you to repair a broken cable.

- 7.0 km with 50/125 m cable
- 7.0 km with 62.5/125 m cable
- 7.0 km with 85/125 m cable
- 5.0 km with 100/140 m cable.

You **can not** connect these modems, DSCT 130 and DSTC 131A, **in a series**, but you can connect several modems in a star configuration. The network can cover an area with a radius of 2 km or 7 km. Please note that redundant Long Distance Buses require separate modems.

The following MasterBus 200 hardware is required for the Long Distance Bus (LDB):

- Modem DSTC 130 for electrical transmission and isolation up to 2.5 kV - 1 physical line per modem
- LDB shielded cable type FLFR 2 x 2 x 0.5
- Modem DSTC 131A for fiber optical transmission if higher isolation is required, one physical line per modem
- Suitable ABB CABLE LDB fiber optic cable. You can use other optical fiber cables if you are considering total attenuation.

Cut off lines you do not use directly at the DSCA 125/DSCA 125A X2 contact to avoid severe noise problems.

Terminate each SDB at one end point with termination net T1 and at the other end with T2. Please refer to Figure A-1.

The modem DSTC 130 contains a termination net T1 strapped according to Figure A-18. If more than one modem is connected to the same SDB, strap the termination net T1 in the modem at the SDB end point. Strap the other modems for multidrop, see Figure A-20.

The modem DSTC 131A contains a termination net T1, strapped according to Figure A-24.

Terminate each LDB at both ends with termination net T3, according to Figure A-19, when you use DSTC 130. Do not terminate fiber optical LDB. Please refer to Figure A-1

The SDB cable is connected to the modem DSTC 130/131A. The SDB is terminated with the termination net T1.

Please refer to Figure A-1.

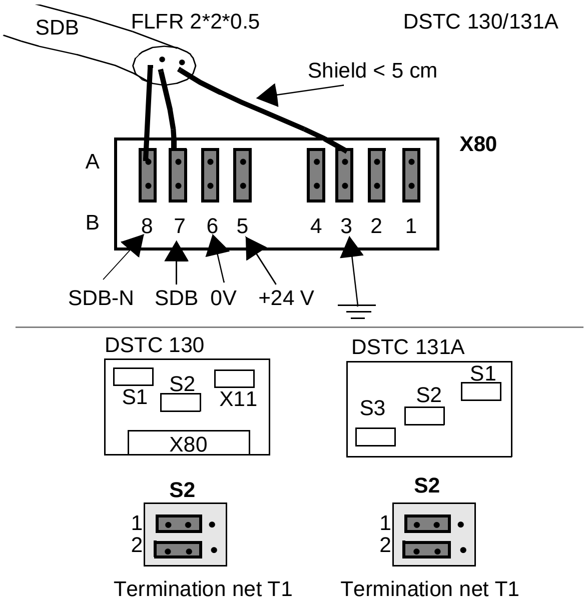


Figure A-18. Connection of SDB to Modem DSTC 130/131A

To connect the LDB FLFR cable, follow the instructions below:

- Use a maximum of 10 modems in multidrop on LDB with a maximum length of 1000 m.
- Use cable type FLFR 2 x 2 x 0.5 with four conductors. Use two diagonal conductors (e.g., blue and white), the other two are cropped.
- Connect the cable shield short (<5 cm) at both ends to the chassis.
- Route the LDB wiring in the cubicle together with communication cables with shield according to information in the manual *Advant® OCS Installation Rules*.
- Connect the cable shield to the grounding bar at entry to the cubicle.
- Route cables between cubicles on cable trays or in ducts and with respect to distance to other cables. Minimum distance is 30 cm. Route the cable together with Advant OCS cables, according to information in the manual *Advant® OCS Installation Rules*.
- If you plan to install the LDB between buildings, please note that you must protect the communication line with suitable overvoltage protection (e.g., 5689 031-A, mounted at the bottom of the cubicle as close to the incoming line as possible.

Terminate FLFR LDB with termination net T3 at both ends of the cable by a connection in the DSTC 130 X80 contact.

Please refer to Figure A-1.

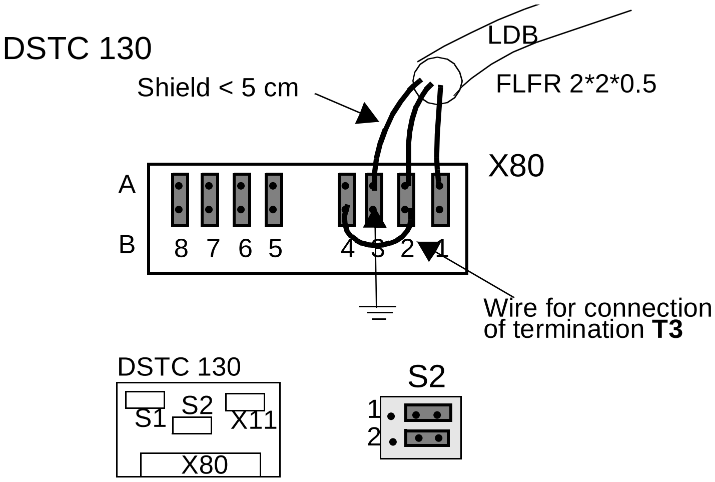


Figure A-19. Termination Net T3 at Both Ends of LDB

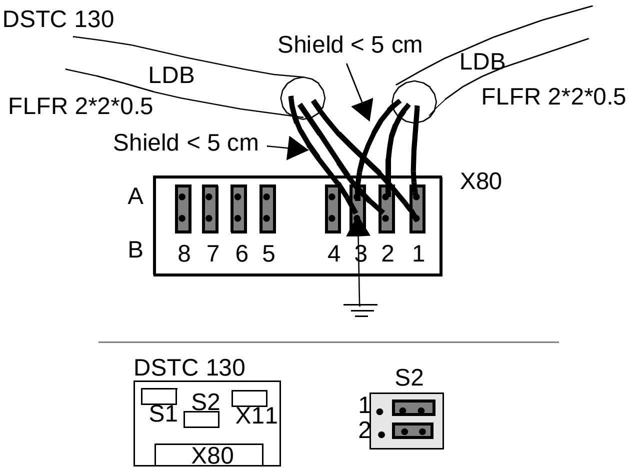


Figure A-20. Connection of LDB in Multidrop

The test strap S1 on DSTC 130 is strapped 1-2.

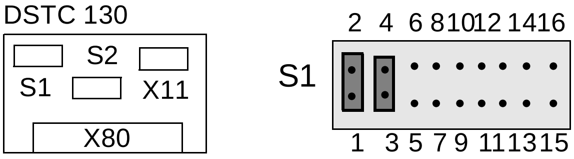


Figure A-21. Test Strap S1 on DSTC 130

You can only configure the fiber optic LDB in point-to-point configuration. Fiber optic LDB is suitable for use when extreme requirements of isolation are required or for passages through environments with a high rate of electromagnetic interference. Bend the fiber optic cable carefully to avoid breakage. Connect the DSTC 131A modem between the SDB and the LDB cable:

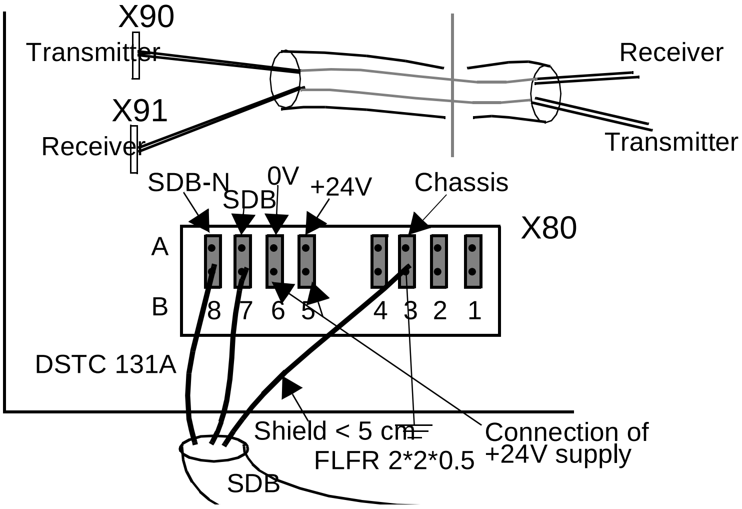


Figure A-22. Connection of LDB Fiber Optic Cable to DSTC 131A

The test strap S1 on the modem DSTC 131A is strapped 5-6 and 7-8.

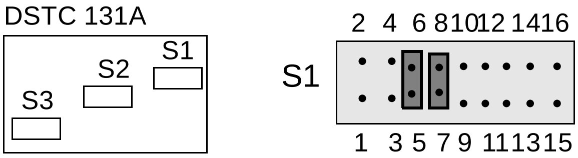


Figure A-23. Test Strap on DSCTC 131A

The output power is controlled via strap group S3 on DSTC 131. Use half output power at distances less than 2000 m and full output power over longer distances.

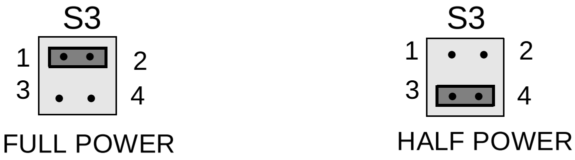
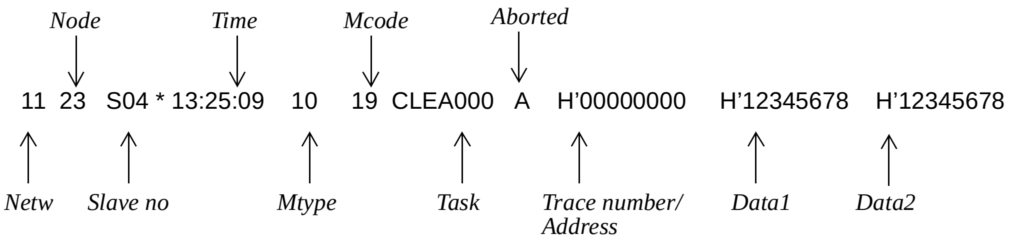


Figure A-24. Strapping of DSTC 131A Transmitter Output

Appendix B System Messages from SC530 GCOM

B.1 System Messages

System message printouts have the following appearance:



```
11  23   S04 * 13:25:09   10    19  CLEA000   A   H'00000000    H'12345678   H'12345678
```

Figure B-1. System Message Layout

The GCOM handler for the multidrop bus, CLEA00, can report a number of erroneous situations through system messages. A system message from CLEA00 always indicates a serious error condition which normally requires that some further actions be taken.

All system messages have:

- Task name = CLEA000 for port 1 and CLEA001 for port 2 on the SC 530 carrier board.
- Data 1 and Data 2 contain useful information about the error. Data 1 often contains the remote node's node number, if relevant, whereas Data 2 shows the slave module from which the system message comes and the type of error, see below.

  Description of variables in system messages:

  - sn = slave module number. Set by DIP switch on the GCOM submodule.
  - syserr = cxsyserr. See Appendix B.2, System Messages from SC530 GCOM.
  - bufst = buffer status. See Appendix B.2, System Messages from SC530 GCOM.
  - dlst = dlstatus. See Appendix B.2, System Messages from SC530 GCOM.
  - sapgr = DLSAP group number. Set by DIP switch on the GCOM submodule.
- Mtype = 34
- The mcodes used are listed below, together with a suggested action when the error occurs.

Table B-1. Mcode from CLEA00

Mcode	Value (decimal)	Comments and suggested action
cldatalerr	2	Data link errors. Check set-up of all communication modules and make a cold start-up of the main CPU. The system is normally followed by an abortion of the GCOM handler.
clXLerr	4	Generic interface errors. Internal error, please contact ABB.
clDLerr	6	Internal errors in the GCOM handler. Internal error, please contact ABB.
clrouterr	8	Error when sending routing vectors. Check set-up of all communication modules and make a cold start-up of the main CPU.
clbuferr	10	Buffer errors. Internal error, please contact ABB.

Table B-2. Abort Parameters from CLEA00

Abort error	Value (decimal)	Comments and suggested action
NoAllocate	0	Failed to allocate buffer
NoWrite	1	Failed to write buffer
NoParamp	2	Illegal pointer to parameter area
NoNetwNode	3	Illegal network or node number
NmroutNotFound	4	Illegal channel index for NMROUT
NoAttach	5	Failed to attach to DLSAP or DSX_XL
NoConnect	6	Failed to connect to DLSAP clea0x
NoInfo	7	No information received from Data Link layer
ToManyNodes	8	To many entries in DL table
GlobDisconn	9	Global disconnect DL handler aborted

Table B-3. System Messages from CLEA00

Trace Number (Hexadecimal)	Parameter description 1 = mcode 2 = data1 3 = data2	Comments
00000001	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to allocate Acknowledge buffer. Preceding abort.
00000002	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to write Acknowledge buffer. Preceding abort.
00000101	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to allocate INIT buffer. Preceding abort.
00000102	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to allocate INIT buffer. Preceding abort.
00000201	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to allocate INIT buffer. Preceding abort.
00000202	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to write INIT_R buffer. Preceding abort.
00000301	1: cldatalerr 2: 0 3: sn:00 00:dlst	Failed to attach to DLSAP1. Preceding abort.
00000302	1: cldatalerr 2: 0 3: sn:00 00:dlst	Failed to attach to DLSAP2. Preceding abort.
00000304	1: cldatalerr 2: 0 3: sn:00 00:netw:node	Hex switch with Network or node number set to 0 for the GCOM submodule. Preceding abort.
00000305	1: clDLerr 2: 0 3: sn:00:netw:node	Failed to store network and node number for the GCOM submodule.
00000401	1: cldatalerr 2: 0 3: sn:00 00:dlst	Failed to connect to DLSAP1. Preceding abort.

Table B-3. System Messages from CLEA00 (Continued)

Trace Number (Hexadecimal)	**Parameter description** **1 = mcode** **2 = data1** **3 = data2**	**Comments**
00000402	1: cldatalerr 2: 0 3: sn:00 00:dlst	Failed to connect to DLSAP2. Preceding abort.
00000501	1: cldatalerr 2: 0 3: sn:00 00:dlst	Failed to get connect. info. Preceding abort.
00000601	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to allocate transitvector buffer. Preceding abort.
00000602	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to write transitvector buffer. Preceding abort.
00000701	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to reallocate transitvector buffer to send on DLSAP1.
00000801	1: clrouterr 2: node (-1) 3: sn:00 00:syserr	Failed to send first routing vector to host processor.
00000901	1: clXLerr 2: node 3: sn:00 00:bufst	Failed to deallocate old buffers during a warm start-up. Check set-up of all communication boards and make a cold start-up.
00000902	1: clDLerr 2: node 3: sn:00 00:bufst	Failed to deallocate data structures for nodes during a warm start-up. Check set-up of all communication boards and make a cold start-up.
00101001	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to deallocate buffer received at DLSAP1.
00101002	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to read buffer received at DLSAP1.
00101101	1: clrouterr 2: node 3: sn:00 00:syserr	Failed to send routingvetcor to host processor.

Table B-3. System Messages from CLEA00 (Continued)

Trace Number (Hexadecimal)	Parameter description 1 = mcode 2 = data1 3 = data2	Comments
00101201	1: clrouterr 2: node 3: sn:00 00:syserr	Failed to send routingvetcor to host processor.
00101202	1: clDLerr 2: node 3: sn:00 0000	All DL-entries are occupied.
00101203	1: clrouterr 2: node 3: sn:00 00:syserr	Failed to send routingvetcor to host processor.
00102001	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to deallocate data buffer received at DLSAP2.
00102002	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to read data buffer received at DLSAP2.
00102003	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to read header buffer received at DLSAP2.
00102004	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to deallocate data buffer received at DLSAP2.
00102101	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to write acknowledge buffer to send on DLSAP2.
00102102	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to reallocate acknowledge buffer to send on DLSAP2.
00102201	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to write acknowledge buffer to send on DLSAP2.
00102202	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to reallocate acknowledge buffer to send on DLSAP2.

Table B-3. System Messages from CLEA00 (Continued)

Trace Number (Hexadecimal)	**Parameter description** **1 = mcode** **2 = data1** **3 = data2**	**Comments**
00102301	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to write INIT_S buffer to send on DLSAP2.
00102302	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to reallocate INIT_S buffer to send on DLSAP2.
00103001	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to deallocate acknowledge buffer received at DLSAP2.
00103002	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to deallocate data buffer already sent.
00103101	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to deallocate faulty buffer.
00103102	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to reallocate data buffer to send.Signal lost.
00103103	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to deallocate faulty buffer.
00103104	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to write data buffer to send. Signal lost.
00103201	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to write INIT_R buffer to send on DLSAP2.
00103202	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to reallocate INITR buffer to send on DLSAP2.
00104001	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to deallocate INIT_R buffer received.
00105001	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to deallocate INIT_S buffer received.

Table B-3. System Messages from CLEA00 (Continued)

Trace Number (Hexadecimal)	**Parameter description** **1 = mcode** **2 = data1** **3 = data2**	**Comments**
00105002	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to reset sequence number in send buffer after INIT_S.
00106001	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to deallocate disconnect buffer received.
00106003	1: clrouterr 2: node (-1) 3: sn:00 00:syserr	Failed to send routingvetcor to host processor.
00106004	1: cldatalerr 2: ORD (Dealloc. error) 3: sn:00 00:dlst	Failed to reconnect to data link. Preceding abort.
00106005	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to deallocate disconnect. Buffer received
00106007	1: clXLerr 2: node 3: sn:00 00:bufst	Failed to deallocate old buffers after a global disconnect signal. Check set-up of all communication boards and make a cold start-up.
00106008	1: clDLerr 2: node 3: sn:00 00:bufst	Failed to deallocate data structures for nodes after a global disconnect signal. Check set-up of all communication boards and make a cold start-up.
00107001	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to deallocate buffer received.
00107002	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to deallocate illegal tpdu received.
00107003	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to deallocate buffer with unknown source node.
00107004	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to deallocate faulty buffer.
00107005	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to read buffer received at DLSAP2.

Table B-3. System Messages from CLEA00 (Continued)

Trace Number (Hexadecimal)	**Parameter description** **1 = mcode** **2 = data1** **3 = data2**	**Comments**
00107006	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to deallocate buffer with illegal DLSAP address.
00108001	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to deallocate buffer with status NoEvent.
00201001	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to deallocate faulty buffer.
00201002	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to reallocate data buffer to send. Signal lost.
00201003	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to deallocate faulty buffer.
00201004	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to write data buffer to send. Signal lost.
00301201	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to deallocate faulty buffer.
00301202	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to reallocate data buffer to send. Signal lost.
00301203	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to deallocate faulty buffer.
00301204	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to write data buffer to send. Signal lost.
00301205	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to deallocate data. Buffer already sent.
00302001	1: clbuferr 2: node 3: sn:00 00:bufst	Failed to deallocate data buffer before deallocate node.

Table B-3. System Messages from CLEA00 (Continued)

Trace Number (Hexadecimal)	Parameter description 1 = mcode 2 = data1 3 = data2	Comments
00302002	1: clDLerr 2: node 3: sn:00 0000	Failed to deallocate DL entries.
00302003	1: clrouterr 2: node 3: sn:00 00:syserr	Failed to send routingvetcor to host processor.
00401001	1: clbuferr 2: 0 3: sn:00 00:bufst	Failed to reallocate transitvector buffer to send on DLSAP1.

B.2 Translation of Variables in System Messages

Table B-4. Interpretation of cxsyserr

Syserr No	Interpretation
0	No error, warm start
1	Cold start
2	Power failure
3	Error in port no
4	Error in signal priority
5	No sqb (queue full)
6	No tqb (sendt)
7	No reply within time for sendw
8	-
9	Error when signal data (resp) was accessed
10	Error in time parameter
11	Response already given
12	Inport not in expected state
13	No inport selected
14	Stack overflow

Table B-4. Interpretation of cxsyserr (Continued)

Syserr No	Interpretation
15	Error in bios system service parameter
16	No iqb with right state available
17	Task already has a reserved device
18	Error reported from handler
19	Abort (system service call)
20	Bus error; param #1 ps #2 effective address
21	The task has been killed
22	Error trap; param #1 ps #2 trap vector address/effective address (odd) address error
23	Illegal trap;param #1 ps #2 trap vector address
24	Pascal runtime error; param #1 pascal runtime.error code, if #2 statement No.
25	Access control block error
26	Illegal concept
27	Illegal logical file
28	Illegal logical record
29	Illegal property number
30	Illegal member number
31	Illegal variant
32	Illegal physical file
33	Illegal group
34	Error in action routine
35	Routine not implemented in system
36	Floating point illegal operation
37	Floating point overflow
38	Floating point underflow
39	Floating point zero divide
40	Floating point inexact result
41	Floating point to integer overflow

Table B-4. Interpretation of cxsyserr (Continued)

Syserr No	Interpretation
42	Illegal network or node number
43	Not used
44	Illegal message length
45	Illegal destination channel id
46	System overloaded

Table B-5. Interpretation of bufstatus and dlstatus

Bufstatus/ Dlstatus No	Interpretation
0	No errors found, function performed
1	Send acknowledge tpdu
2	One block in the buffer is stolen
3	The buffer is too small
4	List of buffers to small
5	Connection attempt failed
6	Connection is already established
7	Connection attempt has started
8	Connect request time-out
9	Send disconnect xpdu
10	Send error xpdu
11	Not valid address
12	Wrong caller layer, no action taken
13	Illegal send condition in DTF specification record for this command
14	Illegal task
15	Insufficient resource, no action taken
16	Internal error
17	Last event in event queue

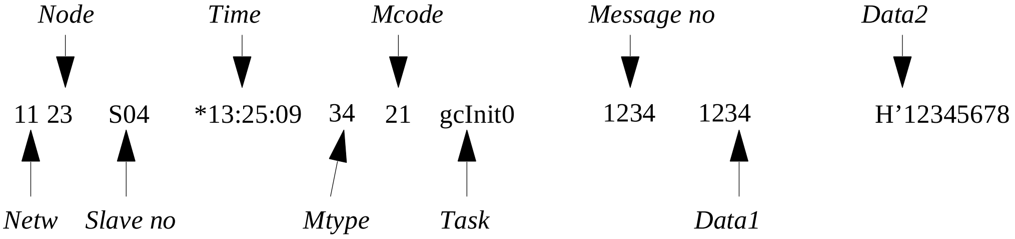
Table B-5. Interpretation of bufstatus and dlstatus (Continued)

Bufstatus/ Dlstatus No	Interpretation
18	Last tsdu to receive
19	Send/receive length error
20	Network quality too low
21	More data to read
22	Lack of tpdu buffers
23	The event queue is empty
24	No detailed status to read in tccb
25	Tccb send queue is full
26	DTF specification record is not active
27	Calling task not attached to sap
28	No tsdu to receive
29	Lack of virtual circuit (tccb)
30	Hardware not working
31	Received old npdu in network layer
32	Parameter error
33	In tr.handler: protocol error
34	Proposed length of tpdu to receive is too short
35	Received disconnect from remote node
36	Proposed length of tpdu to send is too long or zero
37	Illegal status of control block
38	DTF structure is still referenced
39	Referenced structure unknown to DTF
40	Proposed value is illegal
41	Resend data tpdu

Appendix C System Messages from CI543 GCOM

C.1 System messages from CI543 GCOM

System message printouts have the following appearance:



```
11 23   S04   *13:25:09  34  21  gcInit0   1234   1234     H'12345678
```

There are a number of erroneous situations that can be reported by GCOM. A system message indicates a serious error condition that normally requires some further action.

In CI543 GCOM there are some tasks running that may report an error. At start-up, the task `gcInit0` will be running. It initializes GCOM, start two tasks and then it will exit. The two tasks `gcTiTr0` and `gcDatS0` will always be running, even if there are no external nodes on the network.

For each connected external node, there are six tasks created to handle the transceiver channels towards the host system. The tasks that reads data from a transceiver channel are `gcRxnn2`, `gcRxnn3` and `gcRxnn4`. The tasks that writes data to a transceiver channel are `gcTxnn2`, `gcTxnn3` and `gcTxnn4`. **nn** denotes the external node number, which is served by the task. The last digit in the name denotes the priority of the channel which the task reads or writes.

All system messages have:

- Task name: one of the names described above.
- A time
- Mtype = 34 (GCOM)
- Mcode: a number that describes in what part of GCOM an error has occurred.
- Message no: describes the error
- Data1: gives some more information of the error.
- Data2: a logpoint number, useful when finding where the error occurred.

The following tables describes all defined mcodes in CI543 GCOM and for each mcode the defined message numbers. The tables contains some information of what is wrong and what to do. When an internal errors has occurred ABB must be contacted.

Table C-1. Mcodes

Mcode, Error type	Value (decimal values)	Comments
Configuration error	101	Some entry in the database must be changed, restart GCOM. How to configure GCOM is described in the chapter GCOM CI543 Configuration.
Initialization error	102	Error that occurs during the initialization of GCOM. Internal errors.
Datalink layer error	103	Error occurred in the data link layer of GCOM. Most of these errors are internal errors.
Transport layer error	104	Error occurred in the transport layer of GCOM. Most of these errors are internal errors.
Routing error	105	Error occurred in the task that handles sending and receiving routing vectors. Most of these errors are internal errors.

Table C-2. Configuration errors, Mcode = 101

Msg No	Data1 (decimal values)	Comments
1		No configuration information received from the host. Check so that the correct position and subposition is used is the database. Check so that the properties SERVICE and IMPL are set to TRUE.
2	The node number	Invalid node number. Check so that the node number in the database is within valid limits.
3	The network number	Invalid network number. Check so that the network number in the database is within valid limits.
4	The protocol type	Invalid protocol type. Check so that the protocol type used in the database is valid.

Table C-3. Initialization errors, Mcode = 102

Msg No	Data1 (decimal values)	Comments
1	System error: 21=open failed 23=write failed 24=read failed 25=create channel failed 27=allocate buffer failed 28= release buffer failed 29=invalid channel index in received signal.	Failed to get configuration data from the host. Internal error.
2		Failed to initialize the network. Internal error.
3		Failed to get the name of the network interface. Internal error.
4		Failed to get a reference of a named network interface. Internal error
5		Failed to initialize multitasking. Internal error.
6		Failed to allocate memory for a trace buffer Internal error.
7	System error: 4=create semaphore failed 8=create ring buffer failed	Failed to create an internal queue. Internal error.
8		Failed to allocate memory for a timer table. Internal error.
9	System error: 1=alloc memory failed 4=create semaphore failed	Failed to create internal data structure. Internal error.
10	Server number: 1=Routing server 2=Data server	Failed to register a transport layer server into the data link layer.
11		Failed to send the first routing vector. Internal error.

Table C-3. Initialization errors, Mcode = 102 (Continued)

Msg No	Data1 (decimal values)	Comments
12	An error indication: 1=Timer table full 2=Failed to allocate system timer.	Failed to get a timer. Internal error.
13		Failed to start a timer. Internal error.
14	A task number: 1=Routing task. 2=Data server task	Failed to start a task. Internal error.

Table C-4. Errors in Datalink layer, Mcode = 103

Msg No	Data1 (decimal values)	Comments
1		Failed to release a buffer. Internal error.
2		Data was received on an unknown network interface. Internal error.
3		SAP table isn't initialized. Internal error.
4		Failed to allocate a buffer. This may not be a serious problem if there are many external nodes connected with intensive traffic going on. If the message still appears when the traffic intensity is low or there are only a few nodes connected, try to restart GCOM. If the message appears again after restart, please contact ABB.
5		Failed to send an ethernet packet. This message indicates that there are no buffers left. If the message still appears after restart of GCOM, please contact ABB.
6		Failed to send a message to a task due to problem with a semaphore. Internal error.
7	The length	The frame received was to short, less then 3 bytes which is the size of the LLC header.
8	The length	The frame received was to long, more then max size for the current protocol type.

Table C-5. Errors in Transport layer, Mcode = 104

Msg No	Data1 (decimal values)	Comments
1	The source node number	A TPDU was received with an invalid source node number. If this message appears again and again, the traffic on the network must be analyzed to understand the error and to know what to do.
2		Failed to release a buffer. Internal error.
3		Failed to release a semaphore. Internal error.
4		Failed to take a semaphore. Internal error.
5		Failed to delete a semaphore. Internal error.
6		Failed to start a timer. Internal error.
7		Failed to stop a timer. Internal error.
8		Tried to use an invalid timer. This may not be serious if it just appears once when an external node is going down. If the message appears again and again when a node is not going down, this is serious and ABB must be contacted.
9		Failed to send a message to a task due to problem with a semaphore. Internal error.
10	A node number	A node is not connected any more. This may not be serious if the message appears when an external node is going down. If the message appears again and again when a node is not going down, this is serious and ABB must be contacted.
11		Failed to read a transceiver channel when an external node is connected. Internal error.
12		Failed to read a ring buffer. Internal error.
13	The TPDU length	The received TPDU was to short.
14	byte 1 contains the type Byte 2 contains the source node number	An TPDU with illegal type was received.

Table C-6. Errors when sending and receiving routing vectors, Mcode = 105

Msg No	Data1 (decimal values)	Comments
1	The node number	Duplicate node number on the network. There are two nodes that uses the same node number. Check all external nodes on the network.
2		Failed to allocate memory. Internal error.
3		Failed to get a timer. Internal error.
4		Failed to start a timer. Internal error.
5	System error: 4=create semaphore failed 8=create ring buffer failed 15=start a task failed 21=open a transceiver channel failed 25=create a transceiver channel failed.	Failed to connect to an external node. Internal error.
6		Failed to release a buffer. Internal error.
7	The node number	A node that should be active is marked to be not active. Internal error.
8		Failed to take a semaphore Internal error.
9		Failed to give a semaphore. Internal error.
10		Failed to read a ring buffer. Internal error.
11	The routing vector length	The received routing vector was to short.
12	byte 1 contains the type byte 2 contains the source node number.	An routing vector with illegal type was received.
13	The remote node number.	Failed to create transceiver channels for a remote node.

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